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Number Systems

TEST 1

1. **i^{13} = ?**

○ A: 1 ○ B: -1

○ C: I ○ D: -i

2. **If -1 + √-3 = r $e^{i\Theta}$ then Θ equals to?**

○ A: 2 pi / 3 ○ B: -2 pi / 3

○ C: pi / 3 ○ D: - pi / 3

3. **Square roots of -1 are?**

○ A: i , -I ○ B: i

○ C: 1 ○ D: -i

4. $\left(\frac{2i}{1+i}\right)^2$ **is equal to?**

○ A: I ○ B: 2i

○ C: 1-I ○ D: 1-2i

5. **Conjugate of 4 + 5i is?**

○ A: -4 + 5i ○ B: 4 - 5i

○ C: $4^2 + (5i)^2$ ○ D: 5 + 4i

6. **$(1 + i)^2$ = ?**

○ A: 2i ○ B: -2i

○ C: I ○ D: -i

7. **The value of** $\frac{i^{4n+1} - i^{4n-1}}{2}$ **is equal to?**

○ A: 1 ○ B: -1

○ C: I ○ D: -i

8. **If y and g are two complex numbers then** $\overline{y+g} = ?$

○ A: $\bar{y}$. $\bar{g}$ ○ B: $\bar{y}$ / $\bar{g}$

○ C: $\bar{y}$ + $\bar{g}$ ○ D: $\bar{y}$ - $\bar{g}$

9. **(3 + 2i) + (1 + i) = ?**

○ A: 4 + 2i ○ B: 4 + 3i

○ C: 4 - 2i ○ D: 4 - 3i

10. **The complex number i + √3 in polar form can be written as?**

○ A: $\frac{1}{\sqrt{2}}(sin\ \ \pi/6 + i\ cos\ \pi/6)$ ○ B: $2\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$

○ C: $\frac{1}{2}(sin\ \ \pi/6 + i\ cos\ \pi/6)$ ○ D: $4\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$

11. **If g = 2 + i√3 then g.ḡ = ?**

○ A: 2 - i√3 ○ B: 13

○ C: 8 ○ D: 7

12. **The moduli of complex number 1 - i√3 = ?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

13. **4 * (1 - 3i) = ?**

○ A: 4 - 3i ○ B: 40

○ C: 4 - 12i ○ D: None of the above.

14. **Multiplicative identity for complex numbers is?**

○ A: (0 , 0) ○ B: (0 , 1)

○ C: (1 ,1) ○ D: (1 , 0)

15. **If z is a complex number then | z1 . z2 | = ?**

○ A: $\sqrt{(z1)^2 + (z2)^2}$ ○ B: $\sqrt{(z1)^2 - (z2)^2}$

○ C: | z1 | x | z2 | ○ D: | z1 | / | z2 |

16. **(5, 0) * (2 , 0) = ?**

○ A: 10 ○ B: 10 + i

○ C: 10 + 2i ○ D: 10 + 5i

17. **If z = 1 + i then multiplicative inverse of z^2 is?**

○ A: 1 – I ○ B: i / 2

○ C: - i / 2 ○ D: 2i

18. **What is the product of (1 + i) and (1 + 2i)?**

○ A: -2 + I ○ B: 2 + i

○ C: -1 + 3i ○ D: 1 + 3i

19. **The value of | -5i | is?**

○ A: 5 ○ B: 10

○ C: 20 ○ D: 25

20. $\left(\frac{1-i}{1+i}\right)^{20}$ **is equal to?**

○ A: 1 ○ B: 1/2

○ C: -1/2 ○ D: -1

TEST 2

1. **The complex number (1 + 2i) / (1 - i) lies in?**

○ A: I quadrant ○ B: II quadrant
○ C: III quadrant ○ D: IV quadrant.

2. **A complex number added to its additive inverse would give?**

○ A: Multiplicative identity ○ B: Additive identity
○ C: Additive inverse. ○ D: Multiplicative inverse.

3. **If y is a complex number then | -y | = ?**

○ A: | y | ○ B: | ȳ |
○ C: | -ȳ | ○ D: All of the above.

4. **If z is a complex number such that z + 1/z = 1 then the value of $z^{99} + 1/z^{99}$ is ?**

○ A: 1 ○ B: -1
○ C: 2 ○ D: -2

5. Express in terms of *i* the sum of $\sqrt{-81}$ and $2\sqrt{-25}$.

○ A: 9i ○ B: -9i
○ C: 23i ○ D: 19i

6. **Even integers (including zero) are closed under which of the following operation?**

○ A: Addition ○ B: Subtraction
○ C: Multiplication ○ D: All of the above.

7. $\left[i^{67} + \frac{1}{i^{125}}\right] = ?$

○ A: 0 ○ B: 2
○ C: 2i ○ D: -2i

8. **If F = $x^3 + x^2 + 2x + 6$ then F(i) = ?**

○ A: 3 + I ○ B: 5 + i
○ C: 3 – I ○ D: 2 - 5i

9. **Find multiplicative inverse of √2 - i√5 ?**

○ A: -(√2 / 7) + (√5 / 7)I ○ B: (√2 / 7) - (√5 / 7)i
○ C: (√2 / 7) + (√5 / 7)I ○ D: -(√2 / 7) - (√5 / 7)i

10. **Square roots of number $(-3)^2$ are?**

○ A: 3i , -3i ○ B: 3
○ C: -3i ○ D: 3, -3

11. If y is a complex number then $y . \bar{y} = ?$

○ A: $\bar{y}$
○ B: y
○ C: $| - y |^2$
○ D: None of the above.

12. The modulus of the complex number $\frac{(1 - i\sqrt{3})(\cos\theta + i\sin\theta)}{2(1 - i)(\cos\theta - i\sin\theta)}$ is

○ A: $1/\sqrt{2}$
○ B: $1/2\sqrt{2}$
○ C: $1/\sqrt{3}$
○ D: None of these.

13. $(\cos \Theta + i \sin \Theta)^n = ?$

○ A: $(\cos \Theta^n + i \sin \Theta^n)$
○ B: $\cos n\Theta - i \sin n\Theta$
○ C: $\cos n\Theta + i \sin n\Theta$
○ D: $n\cos \Theta + i\, n \sin \Theta$

14. $i^5 + i^6 = ?$

○ A: 1 + I
○ B: -1 + i
○ C: i
○ D: 2I

15. $(-1)^{-21/2} = ?$

○ A: 0
○ B: 1
○ C: I
○ D: -i

16. Multiplicative inverse of the complex number 1 + i is?

○ A: 1 – I
○ B: 1/2 + 1/2i
○ C: 1/2 - 1/2i
○ D: $1/\sqrt{2} - i\, 1/\sqrt{2}$

17. $\frac{2+i}{2-i} - \frac{2-i}{2+i} = ?$

○ A: i / 5
○ B: i / 3
○ C: 8i / 5
○ D: 7i / 5

18. The conjugate complex of number $(2 - i) / (1 - 2i)^2$ is equal to?

○ A: 2 / 25 + i 11 / 25
○ B: 2 / 25 - i 11 / 25
○ C: - 2 / 25 + i 11 / 25
○ D: - 2 / 25 - i 11 / 25

19. If $8iz^3 + 12z^2 - 18z + 27i = 0$, then?

○ A: $|z| = 3/2$
○ B: $|z| = 2/3$
○ C: $|z| = 1$
○ D: $|z| = 1/3$

20. (8 , 9) * (5, -6) =?

○ A: (14, -1)
○ B: (94, -3)
○ C: (48, -2)
○ D: None of the above.

TEST 3

1. The triangle formed by points 1 , $(1 + i) / \sqrt{2}$ and i in the argand diagram is?

○ A: Scalene
○ B: Equilateral
○ C: Isoceles
○ D: Right angled

2. The smallest integer n for which $\left(\frac{1+i}{1-i}\right)^n = 1$ is?

○ A: 4
○ B: 8
○ C: 12
○ D: 16

3. $i^{88} - i^{22} = ?$

○ A: I
○ B: -i
○ C: 1
○ D: 2

4. If $a = |z_1| - |z_2|$; $b = |z_1 + z_2|$ and $c = |z_1| + |z_2|$ then which of the following is true?

○ A: $c \leq b \leq a$
○ B: $a \leq c \leq b$
○ C: $b \leq a \leq c$
○ D: None of the above.

5. if $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$, then b is equal to ?

○ A: $\sqrt{3}$
○ B: $\sqrt{2}$
○ C: 1
○ D: None of the above.

6. Number of solutions for the equation $z^2 + \bar{z} = 0$ is?

○ A: One
○ B: Two
○ C: Three
○ D: Four

7. If s and t are different integers and $\sqrt{st} = 8$, which of the following could *not* be a value of $s + t$?

○ A: 16
○ B: 20
○ C: 34
○ D: 65

8. The modulus of $\sqrt{2i} - \sqrt{-2i}$ is?

○ A: 2
○ B: $\sqrt{2}$
○ C: 0
○ D: $2\sqrt{2}$

9. If $x = \sqrt{-1 - \sqrt{-1 - \sqrt{-1 - \sqrt{-1}}}}$ ... then x is equal to

○ A: w
○ B: w^2
○ C: w or w^2
○ D: 0

10. The number of solutions for the equation $z^2 + |z|^2 = 0$ are? (z is a complex number)

○ A: One
○ B: Two
○ C: Three
○ D: Infinite

11. The smallest positive number n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is?

○ A: 12
○ B: 8
○ C: 4
○ D: 2

12. For positive integers $(1-i)^n \left(1-\frac{1}{i}\right)^n$ equals to?

○ A: 0
○ B: $2i^n$
○ C: 2^n
○ D: 4^n

13. The complex numbers sin x + i cos 2x and cos x - i sin 2x are conjugate to each other for ?

○ A: x = n * pi
○ B: x = (n + 1/2) * pi
○ C: x = 0
○ D: No value of x.

14. Which of the following numbers lie on the imaginary axis of the Argand diagram?

○ A: 8 + 3i
○ B: 0 + 3i
○ C: 8 + 0i
○ D: None of the above.

15. Cube roots of unity?

○ A: Are collinear
○ B: Lie on the circle of radius √3
○ C: Form an equilateral triangle.
○ D: None of the above.

16. Which of the following is true about complex numbers?

○ A: They do not have a multiplicative inverse.
○ B: They don't have an additive inverse.
○ C: They always lie on the imaginary axis of the Argand diagram.
○ D: They don't satisfy the order of axioms.

17. Sum of three consecutive odd numbers is always divisible by?

○ A: 2
○ B: 3
○ C: 4
○ D: 6

18. $(a - ib)^3$ = ?

○ A: $a^3 - i(3a^2b - b^3)$
○ B: $a^3 - 3ab^2 - i(3a^3 - b^3)$
○ C: $a^3 + 3ab^2 - i(3a^2b - b^3)$
○ D: $a^3 - 3ab^2 - i(3a^2b - b^3)$

19. If $p^2 - 2pq + q^2 = c$ where p and q are positive integers and p is even and q is odd which of the following is true?

○ A: c is even and a perfect square.
○ B: c is odd and a perfect square.
○ C: c is even and not a perfect square.
○ D: c is odd and not a perfect square.

20. **If $\left[\frac{(\sqrt{3}/2) + i\,(1/2)}{(\sqrt{3}/2) - i\,(1/2)}\right]^{120} = a + i\,b$, then**

○ A: a = cos 20° and b = - sin 20°
○ B: a = cos 20° and b = sin 20°
○ C: a = 0 and b = 1
○ D: a = 1 and b = 0

TEST 4

1. $\left|(1+i)\left(\frac{2+i}{3+i}\right)\right|$ **is equal to?**

○ A: -1/2
○ B: 1/2
○ C: 1
○ D: -1

2. The value of $(-i)^{1/3}$ is ?

○ A: -I
○ B: i
○ C: 1
○ D: None of the above.

3. Which of the following is an irrational number?

○ A: $\sqrt[3]{-8}$
○ B: $\sqrt{\frac{32}{50}}$
○ C: $5 / \sqrt{5}$
○ D: All of the above.

4. If $(x + iy)(p + iq) = (x^2 + y^2)i$ then?

○ A: $p = x, q = y$
○ B: $p = x^2, q = y^2$
○ C: $q = x, p = y$
○ D: None of the above.

5. If $\odot$ is an operation on positive real numbers, for which of the following definitions of $\odot$ is $r \odot s = s \odot r$ (commutative property)?

○ A: $r \Theta s = r - s$
○ B: $r \Theta s = r / s$
○ C: $r \Theta s = r^2 s$
○ D: $r \Theta s = (r + s) / (rs)$

6. The complex number $1 + i\sqrt{3}$ in polar form is equal to?

○ A: $2 \cos 60^\circ - i\, 2 \sin 60^\circ$
○ B: $4 \cos 60^\circ + i\, 4 \sin 60^\circ$
○ C: $4 \cos 60^\circ - i\, 4 \sin 60^\circ$
○ D: $2 \cos 60^\circ + i\, 2 \sin 60^\circ$

7. (2 , 6) / (3 , 7) = ?

○ A: (6/29 , -1/29)
○ B: (2/29 , -2/29)
○ C: (24/29 , 2/29)
○ D: (18/29 , 2/29)

8. $\frac{(1+i)^n}{(1-i)^{n-2}}$ **is equal to?**

○ A: $4i^{n-2}$
○ B: $2i^{n-4}$
○ C: $2i^{n-1}$
○ D: None of the above.

9. If $z = \frac{\sqrt{3}+i}{2}$, then $(z^{101} + i^{103})^{105}$ is equal to

○ A: I
○ B: -1
○ C: 0
○ D: 1

10. Reciprocal of i is?

○ A: -1

○ B: 1

○ C: I

○ D: -i

11. $\dfrac{(1+i)^{2n+1}}{(1-i)^{2n-1}}$ **is equal to?**

○ A: $2\,(-1)^n$

○ B: 2i

○ C: -2

○ D: 2 + 2i

12. If $\bar{Y} = y$ then y is?

○ A: Complex number

○ B: Real number

○ C: $\bar{Y}$ is complex conjugate of y

○ D: None of the above.

13. The equation $| z - 1 |^2 + | z + 1 |^2 = 2$ represents?

○ A: A circle of radius 1

○ B: A circle of radius 2

○ C: Ordered pair (0, 0)

○ D: A straight line.

14. The number 4 + 3i lies on the ?

○ A: Imaginary axis of the Argand diagram.

○ B: Real axis of the Argand diagram.

○ C: Neither real nor imaginary axis of the Argand diagram.

○ D: None of the above.

15. Absolute value of complex number z = a + ib = ?

○ A: a + b

○ B: $a^2 + b^2$

○ C: $\sqrt{z.\tilde{z}}$

○ D: $z.\tilde{z}$

16. **If** $z = \left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^5$**, then**

○ A: Re (z) > 0

○ B: Re (z) > 0 and Im (z) > 0

○ C: Re (z) > 0 and Im (z) < 0

○ D: Im (z) = 0

17. $\sqrt{\dfrac{1}{-4}}$ **is equal to?**

○ A: i / 2

○ B: - i / 2

○ C: 2 I

○ D: -2 i

18. If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$ then α^{31} is equal to?

○ A: α

○ B: α^2

○ C: 0

○ D: 1

19. (a + bi) * (c + di) = ?

○ A: (ac - bd) + (ad + bc) I

○ B: (ac + bd) + (ad + bc) i

○ C: (ac - bd) + (ad - bc) I

○ D: (ac + bd) + (ad - bc) i

Sets & Functions

TEST 1

1. **If $A \cap B = \Phi$ then A and B are called?**

○ A: Complement of each other.
○ B: Null sets
○ C: Disjoint sets
○ D: Universal sets.

2. **Residue class modulo 5 for 4 + 3 is?**

○ A: 2
○ B: 3
○ C: 5
○ D: 7

3. **$(A \cup B)' = ?$**

○ A: $A' \cup B'$
○ B: $A' \cap B'$
○ C: $A - B$
○ D: $(A - B)'$

4. **If $A = \{1,2,3\}$ and $B = \{2,3\}$, then $A \cup B = ?$**

○ A: $\{1\}$
○ B: $\{2,3\}$
○ C: $\{1,2\}$
○ D: $\{1,2,3\}$

5. **A set of all possible sub sets of a set is known as?**

○ A: Power set
○ B: Proper subset
○ C: Singleton Set
○ D: Universal set.

6. **$A \cap B = \Phi$ then $(A \cup B) = ?$**

○ A: $(A \cup B) = A + B$
○ B: $(A \cup B) = A + B - (A \cap B)$
○ C: $(A \cup B) = (A \cap B)$
○ D: Undefined.

7. **Set of all integers is not closed with respect to?**

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: Division

8. **Which of the following is a singleton set?**

○ A: $\{ \}$
○ B: $\{0\}$
○ C: $\{5\}$
○ D: Both B and C.

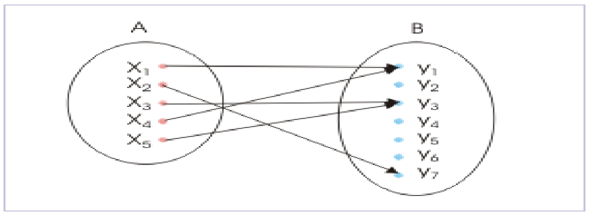
9. **Drawing conclusion from limited number of observations is called?**

○ A: Induction
○ B: Deduction
○ C: Logic
○ D: Proposition

10. **$Z = \{x \mid x = p/q$ where $p,q \in Z$ and $q \neq 0\}$ is a set of?**

○ A: Natural numbers
○ B: All integers
○ C: Irrational numbers
○ D: Rational numbers.

11. The figure below shows what kind of function?



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function

12. Which of the following relations is true?

○ A: 0 ∈ { }
○ B: 0 ∈ {Φ}
○ C: 0 ∈ {0}
○ D: None of the above.

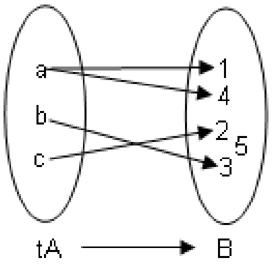
13. Which of the following is defined with respect to the universal set?

○ A: Difference of two sets.
○ B: Intersetction of sets
○ C: Union of sets
○ D: Complement of sets

14. Aristotelian logic has how many possible outcomes?

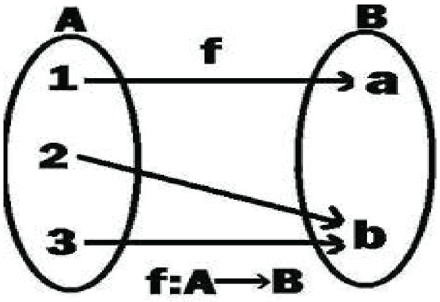
○ A: 1
○ B: 2
○ C: 3
○ D: 4

15. The diagram below shows that?



○ A: f is function from A to B
○ B: f is a one-one function from A to B
○ C: f is an onto function from A to B
○ D: f is not a function

16. The figure below shows what kind of function?



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

17. The domain of the function f = {(1, 3), (3, 5), (2, 6)} is?

○ A: 1, 3 and 2 ○ B: {1,3,2}
○ C: 3, 5 and 6 ○ D: {3,5,6}

18. Residue class modulo 7 for 9 + 5 is?

○ A: 14 ○ B: 7
○ C: 3 ○ D: 0

19. There are how many ways of describing a set?

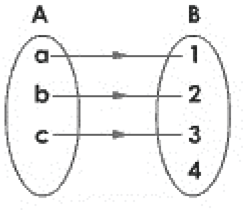
○ A: 1 ○ B: 2
○ C: 3 ○ D: 4

20. If A is a subset of B then A U B =?

○ A: A ○ B: B
○ C: A – B ○ D: B - A

TEST 2

1. **The figure below shows what kind of function?**



○ A: Into Function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

2. **If $(x + 3, y - 2) = (7,5)$ then $(7x, 9y) = ?$**

○ A: $(3,-2)$
○ B: $(28,63)$
○ C: $(35,42)$
○ D: $(49,54)$

3. **If $f = \{(1, 4), (2, 5), (3, 6)\}$ and $g = \{(4, 8), (5, 7), (6, 9)\}$, then (gof) is?**

○ A: $\{\ \}$
○ B: $\{(1, 8), (2, 7), (3, 9)\}$
○ C: $\{(1, 7), (2, 8), (3, 9)\}$
○ D: None of the above.

4. **Logical form of $(A \cup B)' = A' \cap B'$ is?**

○ A: $\sim(p \vee q) = \sim p \wedge \sim q$
○ B: $\sim(p \wedge q) = \sim p \vee \sim q$
○ C: $(p \vee q) = p \wedge q$
○ D: $(p \vee q) \rightarrow \sim p \wedge \sim q$

5. **If A and B are overlapping sets then $A - B =$?**

○ A: A
○ B: B
○ C: $A - (A \cap B)$
○ D: $B - (A \cap B)$

6. **To be classified as a group, the set must satisfy how many properties?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

7. **Set of rational + irrational numbers is a set of?**

○ A: All integers
○ B: All real numbers
○ C: Whole numbers
○ D: All of the above.

8. **Let $A = \{1, 2, 3\}$. Then, the domain of the relation $R = \{(1, 1), (2, 3), (2, 1)\}$ defined on A is?**

○ A: $\{1,2\}$
○ B: $\{1,3\}$
○ C: $\{1,2,3\}$
○ D: None of the above.

9. **All students who appear in GIKI entry test are pass, fail or put in the waiting list. If I appear in the GIKI entry test, I may pass, fail or be in the waiting list. This is an example of (choose the most appropriate answer)?**

○ A: Induction
○ B: Deduction
○ C: Aristotelian logic
○ D: Non Aristotelian logic

10. A - B = Φ and A is not an empty then?

○ A: B = Φ
○ B: B - A = Φ
○ C: A is subset of B
○ D: B is subset of A.

11. If a set has 5 elements. Then number of elements in the power set would be?

○ A: 4
○ B: 8
○ C: 16
○ D: 32

12. Let A and B have 3 and 6 elements, respectively. What can be the minimum number of elements in A U B?

○ A: 3
○ B: 6
○ C: 9
○ D: Cannot determine.

13. If f : A → B be defined by f(x) = x + i, where i is a fixed integer and x set of integers, then f is?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function.
○ D: (1-1) and onto function.

14. If a set is closed with respect to an operation and the operation is associative then the set is called?

○ A: Semi group
○ B: Group
○ C: Monoid
○ D: Both A and C.

15. If A = {1, 2, 3} and B = {3, 4} and C = {4, 5, 6} then (A x B) ∩ (B x C) =?

○ A: {(1,4)}
○ B: {(3,4)}
○ C: {(1,4) , (3,4)}
○ D: {(2,4) , (1,3)}

16. The function f = {(1,2) , (1,3) , (1,4)} is a ?

○ A: Into function
○ B: Onto function
○ C: (1-1) onto function
○ D: None of the above.

17. Converse of $q \rightarrow p$ is?

○ A: $p \rightarrow q$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

18. Set of all integers such that |x-3| < 2 is?

○ A: {1,2,3,4}
○ B: {1,2,3,4,5}
○ C: {2,3,4}
○ D: None of the above.

19. If A={1,2,3} , B = {1,2,3} and C = {3,2,1} which of the following is true?

○ A: A = B
○ B: C is inverse of A
○ C: A = B = C
○ D: Both A and B.

20. If A is a subset of B then A - B = ?

○ A: A
○ B: B
○ C: A - (A U B)
○ D: Φ

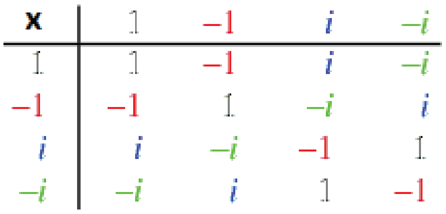
TEST 3

1. **In a town, 48% people are educated, 51% people are young, 60% are servicemen, 24% are educated and young, 25% are young and servicemen, 27% are educated and servicemen and 5% have all three characteristics. How many people (in percentage terms)do not have any of these three characteristics?**

○ A: 12% ○ B: 9%

○ C: 5% ○ D: 0%

2. **The table below shows multiplication operation on a set S = {1,-1,i,-i}. Which of the following is most accurate about the set w.r.t multiplication?**



x	1	−1	i	$-i$
1	1	−1	i	$-i$
−1	−1	1	$-i$	i
i	i	$-i$	−1	1
$-i$	$-i$	i	1	−1

○ A: It is a monoid ○ B: It is a group

○ C: It is an abelian group ○ D: It is a semi group

3. **In a zoo, there are 42 animals in the first sector, 34 in the second sector and 20 in the third sector. Out of these, 24 graze in sector one and also in sector two, 10 graze in sector two and sector three and 12 graze in sector one and sector three. These figures also include four animals grazing in all the three sectors. Find the total number of animals?**

○ A: 46 ○ B: 50

○ C: 54 ○ D: 60

4. **Let R be a relation in N defined by R = {(1+x , x^2) : x < 5 and x Є N}. Which of the following is false?**

○ A: Domain of R = {2,3,4,5} ○ B: Range of R = {4,9,16,25}

○ C: R = {(1,2) , (2,4) , (3,9) , (4,16) , (5,25)} ○ D: R = {(2,4) , (3,9) , (4,16) , (5,25)}

5. **For b Є N, bN = {bx : x Є N} then the first value of the set 6N ∩ 8N is?**

○ A: 8 ○ B: 16

○ C: 24 ○ D: 48

6. **Which of the following is a Singleton set?**

○ A: { x : |x|=5 , x Є N} ○ B: { x : |x|=15 , x Є Z}

○ C: { x : x^2 , x Є Z} ○ D: { x : 1 + x , x Є N}

7. **The set {x : x ≠ x} is?**

○ A: {0} ○ B: {Φ}

○ C: {1} ○ D: { }

8. **If N_a = {an : n Є N}, find the value of $N_6 \cap N_8$?**

○ A: N_6 ○ B: N_8

○ C: N_{12} ○ D: N_{24}

9. **If n(A) = 115 , n(B) = 326 and n(A ∩ B) = 65. Then n(A U B) = ?**

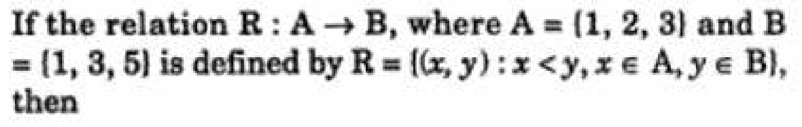
○ A: 68 ○ B: 73

○ C: 128 ○ D: 376

10. Which of the following cannot have a proper subset?

○ A: $\{ x : x \in N\}$ ○ B: $\{ x : x \in Q, 3 < x < 4\}$

○ C: $\{ x : x \in N, 3 < x < 4\}$ ○ D: $\{ x : x \in Z, 3 < x < 6\}$

11. 

If the relation $R : A \to B$, where $A = \{1, 2, 3\}$ and $B = \{1, 3, 5\}$ is defined by $R = \{(x, y) : x < y, x \in A, y \in B\}$, then

○ A: $R = \{(1,3), (1,5), (2,3), (2,5), (3,5)\}$ ○ B: $R = \{(1,3), (1,5), (2,3), (2,5)\}$

○ C: $R^{-1} = \{(3,1), (5,1), (3,2), (5,2), (3,3)\}$ ○ D: $R = \{(1,1), (1,3), (1,5), (2,3), (2,5)\}$

12. Set of cube roots of unit w.r.t addition is?

○ A: Semi group ○ B: Group

○ C: Monoid ○ D: None of the above.

13. If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9 (n - 1) : n \in N\}$, find the value of X U Y?

○ A: X ○ B: Y

○ C: N ○ D: None of the above.

14. Let R by a relation in N defined by $R = \{(x,y) : x + 2y = 8\}$. The range of R is?

○ A: {2,4,6} ○ B: {1,2,3}

○ C: {2,4,6,8} ○ D: {1,2,3,4,5,6}

15. What are the missing entries in the conditional table below? (From top to bottom)

p	q	$p \to q$
T	T	?
T	F	?
F	T	?
F	F	?

○ A: T, F, F, T ○ B: T, T, T, F

○ C: T, F, T, F ○ D: T, F, T, T

16. The number of relations that can be defined on the set A = {a, b, c, d} is?

○ A: 16 ○ B: 24

○ C: 4^4 ○ D: 2^{16}

17. If n(A) = 115 , n(B) = 326 and n(A-B) = 47, then $n(A \cap B)$ = ?

○ A: 373 ○ B: 158

○ C: 68 ○ D: 44

18. Which of the following is an empty set?

○ A: $\{ x : x \in R \text{ and } x^2 - 3 = 0\}$ ○ B: $\{ x : x \in R \text{ and } x^2 + 3 = 0\}$

○ C: $\{ x : x \in R \text{ and } x + 11 = 0\}$ ○ D: $\{ x : x \in R \text{ and } x^4 - 3 = 0\}$

19. If for two sets A and B we have $(A \cup B) = (A \cap B) = B$, then we have?

○ A: $B = \Phi$ and $A \neq \Phi$ ○ B: $A - B = \Phi$

○ C: $B - A = \Phi$ ○ D: $A = B$

20. The set of fourth roots of unity are closed with respect to?

○ A: Addition
○ B: Division
○ C: Subtraction
○ D: None of the above.

TEST 4

1. The inverse of function {(1,2) , (2,3) , (3,4)} is?

○ A: {(1,2) , (2,3) , (3,4)}
○ B: {(1,1/2) , (1/2,1/3) , (1/3,1/4)}
○ C: {(2,1) , (3,2) , (4,3)}
○ D: {(-1,-2) , (-2,-3) , (-3,-4)}

2. 46 in binary is?

○ A: 100110
○ B: 101111
○ C: 101110
○ D: 101010

3. In a town with a population of 5000, the number of people who are egg eaters is 3200. If 2500 are meat eaters and 1500 eat both egg and meat. How many of them eat neither meat nor egg?

○ A: 4200
○ B: 1500
○ C: 800
○ D: 500

4. If A = {1,2,3,4} then {(x,y) | $x+y < 5$} is a ?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function `
○ D: Not a function.

5. If A and B are disjoint sets then A - B = ?

○ A: A
○ B: B
○ C: B – A
○ D: Both A and C.

6. A group is called abelian group if?

○ A: It is closed
○ B: It satisfies associativity
○ C: It has inverse as part of the group.
○ D: It satisfied commutativity.

7. Let A = {a, b, c}. Then, the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is?

○ A: {a, b, c}
○ B: {a, b}
○ C: {a}
○ D: {b,c}

8. Contrapositive of $p \rightarrow q$ is?

○ A: $q \rightarrow p$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

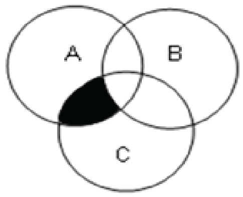
9. X = {0,1,2,3,4 .....} is a set of?

○ A: Natural numbers
○ B: Whole numbers
○ C: All integers
○ D: All of the above.

10. All Irish people drink beer. If someone is Irish he would definitely drink beer. The logic is an example of?

○ A: Proposition
○ B: Induction
○ C: Deduction
○ D: Logic analysis

The shaded area in this diagram represents

11. 

○ A: $A \cap C$ ○ B: $(A \cap B) - C$

○ C: $(A - C) \cap (A - B)$ ○ D: $(A \cap C) - B$

12. Set of natural numbers is closed with respect to?

Addition, Multiplication, Subtraction

○ A: i only ○ B: ii only

○ C: i and ii only ○ D: i, ii and iii

13. If a function $f: A \rightarrow B$ is such that Ran f = B then f is a/an ?

○ A: Into function ○ B: Onto function

○ C: (1 – 1) and onto ○ D: Both B and C.

14. A, B and C are three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Which of the following conditions is true according to the given statement?

○ A: $A = B$ ○ B: $B = C$

○ C: $A = C$ ○ D: $A = B = C$

15. The set of cube roots of unit is closed with respect to?

○ A: Multiplication ○ B: Addition

○ C: Subtraction ○ D: None of the above.

16. If set $A = \{1, w, w^2\}$ is an abelian group then inverse of w is?

○ A: 1 ○ B: w

○ C: w^2 ○ D: Abelian group does not have an inverse.

17. The range of the function $f(x) = |x - 1|$ is? Where domain is the set of all integers.

○ A: $(-\infty, \infty)$ ○ B: $(0, \infty)$

○ C: $[0, \infty)$ ○ D: $(-\infty, 0)$

18. Which of the following is true about the null set?

It is the subset of every set. Number of elements in its power set is zero. It contains no elements

○ A: iii only ○ B: i and iii only

○ C: ii and iii only ○ D: i, ii and iii.

19. $Z = \{x \mid x \neq p/q$ where $p, q \in Z$ and $q \neq 0\}$ is a set of?

○ A: Natural numbers ○ B: All integers

○ C: Irrational numbers ○ D: Rational numbers.

20. If $A \cap B \neq \Phi$ then $(A \cup B) = ?$

○ A: $A + B$ ○ B: $(A \cup B) = A + B - (A \cap B)$

○ C: $(A \cup B) = A + B + (A \cap B)$ ○ D: Φ

Matrices & Determinations

TEST 1

1. **Inverse of the matrix $\begin{bmatrix}1 & -2\\ 3 & 4\end{bmatrix}$ is?**

○ A: $10\begin{bmatrix}4 & -2\\ 3 & 1\end{bmatrix}$ ○ B: $\frac{1}{10}\begin{bmatrix}4 & -2\\ 3 & 1\end{bmatrix}$

○ C: $\frac{1}{10}\begin{bmatrix}4 & 2\\ -3 & 1\end{bmatrix}$ ○ D: $10\begin{bmatrix}4 & 2\\ -3 & 1\end{bmatrix}$

2. **The matrix below has order of?**

$$\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix}$$

○ A: 6 x 1 ○ B: 2 x 3

○ C: 3 x 2 ○ D: 2 x 2

3. **If *A* and *B* are matrices, then which from the following is true ?**

○ A: $A + B \neq B + A$ ○ B: $(A^t)^t \neq A$

○ C: $AB \neq BA$ ○ D: All are true.

4. **A squar matrix is one in which?**

○ A: $n = m^2$ ○ B: $n^2 = m$

○ C: $n = m$ ○ D: All numbers are squares of integers.

5. **The number of non-zero rows in an echlon form is called ?**

○ A: reduced echlon form ○ B: rank of the matrix

○ C: conjugate of the matrix ○ D: co-factor of the matrix

6. **M_{12} the matrix given below is?**

$$\begin{vmatrix}2 & 1 & 1\\ 1 & 2 & 1\\ 1 & 1 & 2\end{vmatrix}$$

○ A: $\begin{vmatrix}2 & 1\\ 1 & 2\end{vmatrix}$ ○ B: $\begin{vmatrix}1 & 1\\ 1 & 2\end{vmatrix}$

○ C: $\begin{vmatrix}2 & 1\\ 1 & 1\end{vmatrix}$ ○ D: $\begin{vmatrix}1 & 2\\ 1 & 1\end{vmatrix}$

7. **The matrix given below is a?**

$$\begin{bmatrix}1 & 3 & 2\\ 3 & 0 & 1\\ 2 & 1 & 5\end{bmatrix}$$

○ A: Symmetric. ○ B: Skew Symmetric

○ C: Hermitian ○ D: Skew Hermitian

8. What is the order of the matrix given below?

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

○ A: 6 x 1
○ B: 2 x 3
○ C: 3 x 2
○ D: 2 x 2

9. Determinant of singular matrix is ?

○ A: 1
○ B: positive
○ C: negative
○ D: 0

10. If the system of equations $x - Ky - z = 0$, $Kx - y - z = 0$, $x + y - z = 0$ has a non-zero solution, then the possible values of K are?

○ A: -1, 2
○ B: 1, 2
○ C: 0, 1
○ D: -1, 1

11. The following matrix is?

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{bmatrix}$$

○ A: Non singular
○ B: Unit matrix
○ C: Lower triangle.
○ D: Upper Triangle.

12. Value of $\begin{vmatrix} w & 1 & w \\ w & 2 & w \\ w & 3 & w \end{vmatrix}$ is?

○ A: w
○ B: 0
○ C: 1
○ D: 2

13. If $A = \begin{bmatrix} 2 & 5 \\ 5 & 2 \end{bmatrix}$, then $A^3 - 4A^2$ is equal to

○ A: $\begin{bmatrix} 42 & 105 \\ -105 & 42 \end{bmatrix}$
○ B: $\begin{bmatrix} 42 & 105 \\ 105 & 42 \end{bmatrix}$
○ C: $\begin{bmatrix} 105 & 42 \\ 105 & 42 \end{bmatrix}$
○ D: None of the above.

14. A determinant remains same if :

○ A: Every element in a column is multiplied by the same factor
○ B: Two columns are interchanged.
○ C: Two rows are interchanged.
○ D: Each element of any row is added to the corresponding element of any other row multiplied by given factor

15. For matrices $(AB)^t$ = ?

○ A: A^tB^t
○ B: AB
○ C: B^tA^t
○ D: BA

16. If A = $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A|$ is?

○ A: 2
○ B: 3
○ C: 4
○ D: 5

17. If AB = A then, B is a?

○ A: Unity Matrixq
○ B: Identity Matrix
○ C: Inverse of A
○ D: Both A & B.

18. If the order of matrix *A* is *m* x *p*. And the order of *B* is *p* x *n*. Then the order of *AB* is ?

○ A: m x p
○ B: p x n
○ C: m x n
○ D: n x m

19. For matrices A^{-1} = ?

○ A: $Adj\ A\ |A|$
○ B: $|A|\ \frac{1}{Adj\,A}$
○ C: $\frac{1}{|A|\ A} Adj\ A$
○ D: $\frac{1}{|A|} Adj\ A$

TEST 2

1. Inverse for the matrix $a = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is?

○ A: $\frac{1}{ad - bc} \begin{bmatrix} d & b \\ c & a \end{bmatrix}$
○ B: $\frac{1}{ab - cd} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
○ C: $\frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
○ D: $\frac{1}{ad - bc} \begin{bmatrix} -d & -b \\ -c & -a \end{bmatrix}$

2. For matrices if AX = B then which of the following conditions holds?

○ A: $X = A^{-1}B$
○ B: $A^{-1}(AX) = BA^{-1}$
○ C: $X = BA^{-1}$
○ D: All of the above.

3. For matrices, if AX=B then X = ?

○ A: B / |A|
○ B: $\frac{1}{|A|} * adj(A.B)$
○ C: $B.(\frac{1}{|A|}adjA)$
○ D: $(\frac{1}{|A|} * adjA).B$

4. Fine the cofactor A_{23} for the matrix $\begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix}$

○ A: 7
○ B: 0
○ C: 23
○ D: -7

5. **The matrix** $B = \begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$ **can be defined as?**

○ A: Symmetric

`○ B: Skew Symmetric

○ C: Triangular

○ D: Hermitian

6. **Find the cofactor A$_{22}$ for the** $\begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

○ A: 8

○ B: -7

○ C: -10

○ D: 3

7. **If A is a square matrix, then A^{-1} does not exist if**

○ A: |A|>0

○ B: |A|<0

○ C: |A|=0

○ D: A≠0

8. **Value of determinance is?**

○ A: 0

○ B: 1

○ C: x+y+z+w

○ D: xyzw

If

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

9. then order of matrix A = ?

○ A: 3 x 2

○ B: 2 x 3

○ C: 3 x 3

○ D: 2 x 2

10. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

○ A: 8

○ B: -8

○ C: 400

○ D: 0

11. **If I is an identity matrix, then?**

○ A: I^n=0

○ B: I^n=I

○ C: 2I=0

○ D: None of these.

12. **If x, y and z are non zero numbers. The inverse of matrix** $\begin{bmatrix} x & y \\ z & 1 \end{bmatrix}$ **is?**

○ A: $\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$

○ B: $\dfrac{1}{x - yz} \begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & -y \\ -z & -x \end{bmatrix}$

○ D: None of these.

13. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ **and** $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ **then?**

○ A: $\alpha = a^2 + b^2, \beta = -2ab$
○ B: $\alpha = a^2 + b^2, \beta = ab$
○ C: $\alpha = a^2 - b^2, \beta = 2ab$
○ D: $\alpha = a^2 + b^2, \beta = 2ab$

14. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ **and** $B = \begin{bmatrix} 1 & 23 \\ 0 & -10 \end{bmatrix}$ **then |AB| is?**

○ A: 80
○ B: 100
○ C: -110
○ D: 90

15. The number of non-zero rows when a matrix is reduced to echelon matrix form is known as?

○ A: Rank of the matrix.
○ B: Degree of matrix.
○ C: Skew echelon of matrix.
○ D: None of the above.

16. If augmented matrix of a system is of form $\begin{bmatrix} 1 & 0 & : & 5 \\ 0 & 1 & : & -3 \end{bmatrix}$ **Solution to the equations of the system is?**

○ A: 1 and 0
○ B: 0 and 1
○ C: 5 and -3
○ D: None of the above.

17. The value of the determinant given below is equal to

$$\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$$

○ A: 6 xyz
○ B: xyz
○ C: 4 xyz
○ D: xy + yz +zx

18. If a matrix A is multiplid with a number k then the determinant of resulting matrix is?

○ A: k |A|
○ B: 1/k |A|
○ C: k^2|A|
○ D: |A|

The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

19.

○ A: -3, 1
○ B: -1, 3
○ C: 3, 1
○ D: -3, -1

20. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ **then** A^2**= ?**

○ A: $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
○ C: $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
○ D: $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

TEST 3

1. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

○ A: [2, 4]
○ B: [0, 4]
○ C: [1, 4]
○ D: None of these.

2. If A and B are symmetric matrices, then AB + BA is a?

○ A: Symmetric matrix
○ B: Skew symmetric matrix
○ C: Diagonal matrix
○ D: Triangular matrix

3. Which of the following is an Echelon form of a matrix?

○ A: $\begin{bmatrix} 0 & 1 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$
○ C: $\begin{bmatrix} 0 & 2 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 8 \end{bmatrix}$
○ D: Both A & B.

4. 1, 2, 3, 4 are four numbers. If a matrix of order m x n is formed by using all the four numbers, then how many set of values (m, n) are possible?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

5. If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

○ A: $\begin{bmatrix} 13 & 4 \\ 8 & 5 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$
○ C: $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$
○ D: $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

6. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x, y not equal to zero, then D is

○ A: Divisible by neither x nor y.
○ B: Divisible by both x and y
○ C: Divisible by x but not y
○ D: Divisible by y but not x

7. $\begin{vmatrix} a+x & b & c \\ a & b+y & c \\ a & b & c+z \end{vmatrix}$ is equal to

○ A: $xyz\,(1 + a/x + b/y + c/z)$
○ B: $xyz\,(1 + x/a + y/b + z/c)$
○ C: $xyz\,(1 + x + y + z)$
○ D: $xyz\,(1 + a + b + c)$

Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$

8. If $|A|^2 = 25$, then $|\alpha|$ is equal to

○ A: 1/5q

○ B: 5

○ C: 1

○ D: 25

9. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ such that $A + A^C = I$, then value of α is

○ A: $\pi/6$

○ B: $\pi/3$

○ C: π

○ D: 0

10. Which is the following is the condition for a Skew Hermitian matrix?

○ A: $(\bar{A})^t = A$

○ B: $(\bar{A})^t = A^2$

○ C: $(\bar{A})^t = -A$

○ D: $\bar{A}^t = -A^2$

11. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$**, where** $a = i$, $b = \omega$, $c = \omega^2$**, then** Δ **is equal to**

○ A: I

○ B: -1

○ C: 1

○ D: -i

12. If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$, then f(100) is equal to

○ A: 0

○ B: 1

○ C: 100

○ D: -100

13. The solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$ is

○ A: 1, 2, 3

○ B: 1, 2, -3

○ C: -1, 2, 3

○ D: -1, -2, 3

14. Which of the following is true for Echelon Form of a Matrix?

○ A: In any row, the number of zeros before the leading entry is greater than the number of such zeros in the preceding row.

○ B: All non zero rows preceeds row including zeros.

○ C: First entry in any non zero row is 1.

○ D: All of the above.

15. The matrix $A = \begin{bmatrix} 1 & 1-i \\ 1+i & 2 \end{bmatrix}$ **is a?**

○ A: Symmetric Matrix

○ B: Hermitian Matrix

○ C: Skew symmetric matrix

○ D: Skew hermitian matrix

16. The value of the determinate $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

○ A: 5√3 (-√6 – 5) ○ B: 5√3 (√6 – 5)

○ C: 5√3 (5 - √6) ○ D: √3 (√6 – 5)

17. If A and B are symmetric matrices, then AB would equal to?

○ A: -BA ○ B: BA

○ C: 0 ○ D: I

18. In reduced echelon form of the matrix if first non zero entry of a row lies in Column j, all other entries in the column are?

○ A: Positive ○ B: Negative

○ C: Zero ○ D: None of the above.

TEST 4

1. For the matrix below find the |A|?

$$A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

○ A: 30 ○ B: 40

○ C: 50 ○ D: 60

2. A triangular matrix is always a?

○ A: Echelon form of Matrix. ○ B: Reduced Echelon form of Matrix.

○ C: Square matrix. ○ D: Non of the above.

3. What is the conjugate of matrix $A = \begin{bmatrix} i & 10+i \\ -2i & 1-i \end{bmatrix}$

○ A: $\begin{bmatrix} -i & 10+i \\ -2i & 1+i \end{bmatrix}$ ○ B: $\begin{bmatrix} i & 10-i \\ 2i & 1-i \end{bmatrix}$

○ C: $\begin{bmatrix} -1 & 10-i \\ 2 & 1+i \end{bmatrix}$ ○ D: $\begin{bmatrix} -i & 10-i \\ 2i & 1+i \end{bmatrix}$

4. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

○ A: α=1 ○ B: α=0

○ C: α=-1 ○ D: None of these.

5. The matrix A = $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ can be described as?

○ A: Hermitian ○ B: Skew Hermitian

○ C: Symmetric ○ D: Skey Symmetric.

For a system of equations,

$x + 3y + 2z = 3$

$4x + 5y - 3z = -3$

$3x - 2y + 17z = 42$

6. Fine the values of x, y and z if the echelon form of matrix is $\left[\begin{array}{ccc|c} 1 & 3 & 2 & :3 \\ 0 & 1 & -1 & :-3 \\ 0 & 0 & 1 & :2 \end{array}\right]$

○ A: x = 2 ; y = -1; z = 2 ○ B: x = -2 ; y= 1; z= 2

○ C: x = 4 ; y = -1; z = 2 ○ D: x= 2 ; y =-2; z = 2

7. Find the value of a if the following matrix is singular $\begin{bmatrix} -4 & 2 \\ -6 & a \end{bmatrix}$

○ A: -3 ○ B: 3

○ C: 5 ○ D: -5

8. If A=$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A is symmetric then?

○ A: x=0, y=5 ○ B: x+y=5

○ C: x=y ○ D: None of the above.

9. Let $A = \begin{vmatrix} 1 & bc & a(b+c)) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b)) \end{vmatrix}$**. Value of A is equal to?**

○ A: ab + bc +ca ○ B: a + b + c

○ C: $(a + b + c)^2$ ○ D: None of the above

10. If in a square matrix A two rows or two columns are interchanged the determinant of the resulting matrix is?

○ A: A^{-1} ○ B: -|A|

○ C: |A| ○ D: None of the above.

11. What is the rank of the matrix $A = \begin{bmatrix} 1 & 0 & 7 & -2 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

12. What is value of the determinant $A = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{vmatrix}$

○ A: 25 ○ B: -25

○ C: 30 ○ D: -30

13. If ω is the cube root of unity then the value of is ?

○ A: $a^3 + b^3 + c^3$ ○ B: ab - bc

○ C: 0 ○ D: $a^3 + b^3 + c^3$ -3abc

14. If x + ay = 0; y + az = 0; z + ax = 0, then the value of ‘a’ for which the system of equations will have infinite number of solutions is?

○ A: 1 ○ B: 0

○ C: -1 ○ D: None of these.

Quadratic Equations

TEST 1

1. **Find the value of x where $9x^2 - 12x - 5 = 0$.**

○ A: -1/3 , 5/3
○ B: -2/3 , 5/3
○ C: -1/3, 2/3
○ D: 2/3 , 5/3

2. **$\omega^{-12} = ?$**

○ A: ω
○ B: ω^2
○ C: 1
○ D: 0

3. **If x-a is a factor of f(x) then f(a) = ?**

○ A: a
○ B: 0
○ C: 1
○ D: w

4. **Solution to the equation $6x^2 + x - 15 = 0$ is?**

○ A: 3/2 , -3/2
○ B: 6/7 , -4/5
○ C: 3/2 , -5/3
○ D: None of the above.

5. **Roots of the equation $2x^2 + 5x - 1$ are?**

○ A: Complex
○ B: Irrational
○ C: Equal
○ D: Rational

6. **The condition for polynomial equation $ax^2 + bx + c = 0$ to be quadratic is?**

○ A: $a > 0$
○ B: $a < 0$
○ C: $a \neq 0$
○ D: $a \neq 0$ and $b \neq 0$

7. ***If the product of the roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, the value of m is?***

○ A: 1
○ B: -1
○ C: 1/3
○ D: -1/3

8. **Quadratic equations are?**

○ A: First degree polynomials.
○ B: Second degree polynomials.
○ C: Third degree polynomials.
○ D: Fourth degree polynomials.

9. **$1 + \omega + \omega^2 = ?$**

○ A: 1
○ B: ω
○ C: ω^2
○ D: 0

10. **For quadratic equation $ax^2 + bx + c = 0$, Sum of roots is equal to?**

○ A: b/a
○ B: -b/a
○ C: c/a
○ D: -c/a

11. **If S and P are the sum and products of the roots of the quadratic equation, then the equation may be written as?**

○ A: $x^2 + Sx + P = 0$
○ B: $x^2 - Sx - P = 0$
○ C: $x^2 - Sx + P = 0$
○ D: $x^2 + Sx - P = 0$

12. Roots of the equation $x^2 + 7x + 12$ are?

○ A: 3, 4 ○ B: -3, 4

○ C: 3, -4 ○ D: -3, -4

13. Sum of all fourth roots of unit is?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

14. Product of all fourth roots of unity are?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

15. $\frac{-1+\sqrt{3}i}{2} * \frac{-1-\sqrt{3}i}{2}$ **= ?**

○ A: $\frac{-1+\sqrt{3}i}{2}$ ○ B: $\frac{-1-\sqrt{3}i}{2}$

○ C: 1 ○ D: 0

16. The solution for equation $x^2 - x = 2$ is?

○ A: 1 , -2 ○ B: -1, 4

○ C: 2, -1 ○ D: 2, -3

TEST 2

1. The degree of the equation $x^4 + 1/x^4 - 3 = 0$ is?

○ A: 4 ○ B: 6

○ C: 8 ○ D: None of the above.

2. x + 2 is a factor of ?

○ A: $x^4 + 2$ ○ B: $x^4 - x^2 + 12$

○ C: $x^4 - 2x^3 - x + 2$ ○ D: $x^4 + 2x^3 - x - 2$

3. If the equation $x^3 + 4x^2 - 2x + 5$ is divided by x-1 the remainder is?

○ A: 10 ○ B: 9

○ C: 8 ○ D: 7

4. $\omega^{-5} = ?$

○ A: ω ○ B: ω^2

○ C: 1 ○ D: None of the above.

5. The equation $\sqrt{x+3}+\sqrt{x+5}=\sqrt{3x+2}$ is called?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal equation ○ D: Square root equation.

6. The equation $2^{2x} + 4^x - 10 = 0$ is?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal ○ D: None of the above.

7. Out of the three cube roots of unit, how many are imaginary?

○ A: 1 ○ B: 2

○ C: 3 ○ D: Zero

8. If ω is the complex cube root of unity then $\omega = ?$

○ A: 0 ○ B: 1

○ C: ω^2 ○ D: ω^{-1}

9. If $x^2 + 1/x^2 = 27$, then the value of $x - 1/x$ is equal to ?

○ A: 5 ○ B: 4

○ C: 3 ○ D: 2

10. If the equation $x^3 + 4x^2 - 2x + 5 = 0$ is divided by x+1 the remainder is?

○ A: 10 ○ B: 9

○ C: 8 ○ D: 7

11. If one root of the equation $x^2 + px + q = 0$ is double the other, p^2/q is?

○ A: 1 ○ B: 1/2

○ C: 2/9 ○ D: 9/2

12. Roots of the equation $x^2 + 2x + 3 = 0$ are?

○ A: Unequal
○ B: Real
○ C: Complex
○ D: Both A & C.

13. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is?

○ A: 12
○ B: 4
○ C: 23/6
○ D: 49/4

14. $1/\omega = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: 0

15. If the roots of $ax^2 + b = 0$ are real and distinct, then?

○ A: $ab > 0$
○ B: $a = 0$
○ C: $a > 0$ and $b < 0$
○ D: $ab < 0$

16. If $b^2 - 4ac$ for a quadratic equation is a perfect square the roots are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of these.

17. Cube roots of 8 are?

○ A: $-2, -2w$ and $-2w^2$
○ B: $2, 2w$ and $2w^2$
○ C: $2, w$ and w^2
○ D: $1, w$ and w^2

18. The roots of the equation $9x^2 - 12x + 4 = 0$ are?

○ A: Equal
○ B: Complex
○ C: Irrational
○ D: Unequal

19. If j and k are the roots of the equation $2x^2 - 4x + 5 =0$ then $(j+1)(k+1) = ?$

○ A: 11/2
○ B: -11/2
○ C: 2/11
○ D: -2/11

20. $x^4 - 2x^3 + 8x^2 -2x +1$ is called?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal equation
○ D: None of the above.

TEST 3

1. **$(1 + w - w^2)^8$ = ? where w is cube root of unity**.

○ A: $256w^2$

○ B: $-256w^2$

○ C: $256w$

○ D: $-256w$

2. **For what value of m the given equation would have equal root.**

$(m + 1)x^2 + 2(m+3)x + m + 8 = 0$

○ A: ½

○ B: 1/3

○ C: -1/3

○ D: 2/3

3. **The number of real solutions of $|x|^2 + 3|x| + 2 = 0$ is?**

○ A: 1

○ B: 2

○ C: 3

○ D: 0

4. **The roots of equation $x^2 + k = 0$, $k < 0$, are?**

○ A: Complex conjugates

○ B: Real and distinct

○ C: Real and same

○ D: Rational

5. **The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is**

○ A: 2

○ B: -2

○ C: 0

○ D: None of these.

6. **If the roots of the equation $ax^2 + bx + c = 0$ are such that their sum is equal to the sum of their squares, then?**

○ A: $2ac = ab + b^2$

○ B: $2ac = a^2 + b^2$

○ C: $2ac = ab + b^3$

○ D: None of the above.

If α, β be the roots of $x^2 - 2x + 4 = 0$, $(\alpha^5 + \beta^5)$ = ?

Hint: $(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$.

○ A: 243

○ B: 81

○ C: 64

○ D: 32

7. **If the equation $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a common non-zero root, the value of λ is?**

○ A: -1

○ B: 1

○ C: 3

○ D: -3

8. **The number of real roots of $(x + 1/x)^3 + (x + 1/x) = 0$ is**

○ A: 0

○ B: 2

○ C: 4

○ D: 6

9. **If $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, the value of $(a + b)$ is?**

○ A: 1

○ B: -1

○ C: 2

○ D: 1/2

10. **If α and β are the roots of the equation $ax^2 + bx + c$, what is equation with roots 1/α and 1/β?**

○ A: $cy^2 + by - a = 0$

○ B: $cy^2 - by - a = 0$

○ C: $y^2 + by + a = 0$

○ D: $cy^2 + by + a = 0$

11. If x = (3 + √ 5), the value of ($2x^3$ - $9x^2$ - 10 x + 13) is ?

○ A: 0
○ B: 1
○ C: 12 √ 5
○ D: None of the above.

12. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3$ is equal to

○ A: -1
○ B: 0
○ C: 1
○ D: 2

13. If one root of the equation $ax^2 + bx + c = 0$ is twice the other, then?

○ A: $2b^2 = 9ac$
○ B: $b^2 = 4ac$
○ C: $b^2 = 9ac$
○ D: $3b^2 = ac$

14. Only one of the root of the equation $ax^2 + bx + c = 0$, is zero, and a ≠ 0 if,

○ A: c = 0
○ B: c = 0 and b ≠ 0
○ C: b = 0 and c = 0
○ D: b ≠ 0 and c ≠ 0

15. If α and β are the roots of equation $ax^2 + bx + c = 0$ the value of $\alpha^2 + \beta^2$ is?

○ A: $\frac{b^2 + 2ca}{a^2}$
○ B: $\frac{b^2 - 2ca}{a}$
○ C: $\frac{b^2 - 2ca}{a^2}$
○ D: $\frac{b - 2ca}{a^2}$

16. If a > 0 and x = $\sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \ldots\ldots\ldots\ldots\infty}}}}$, the value of x is

○ A: $\frac{\sqrt{4a - 1}}{2}$
○ B: $\frac{1 \pm \sqrt{4a + 1}}{2}$
○ C: $\frac{-1 \pm \sqrt{4a + 1}}{2}$
○ D: $\frac{-2 \pm \sqrt{4a + 1}}{2}$

17. The roots of the equation $3^{2x+3} + 37 = 10\,(73.3^x + 1)$ are?

○ A: 2, -2
○ B: 3 , -3
○ C: 8 , 1/9
○ D: 3 , 1/3

18. Roots of the equation $x^2 + 5x - 1 = 0$ are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of the above.

19. If α + β = 4 and $\alpha^3 + \beta^3 = 44$, α, β are the roots of ?

○ A: $2x^2 - 7x + 16 = 0$
○ B: $3x^2 + 9x + 11 = 0$
○ C: $9x^2 - 27x + 20 = 0$
○ D: None of the above.

TEST 4

1. **The equation $x^5 + x^3 + 2x + 1 = 0$ has**

○ A: No positive roots ○ B: Some positive roots

○ C: No negative roots ○ D: None of the above.

2. $(-1+\sqrt{-3})^4 + (-1-\sqrt{-3})^4 = ?$

○ A: 16ω ○ B: -16

○ C: 16 ○ D: $16\omega^2$

3. **For quadratic equations, If $b^2 - 4ac$ is a perfect square then the roots are?**

○ A: Rational ○ B: Irrational

○ C: Equal ○ D: Complex

4. **The number of real roots of the equation $x^6 - 7x^3 - 8 = 0$ is?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 6

5. **If $x^3 + kx^2 -7x + 6$ is divided by $x + 2$, the remainder is -8. The value of k is?**

○ A: 5 ○ B: -5

○ C: 1 ○ D: -1

6. **If the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 58$ is divided by $(x - 2)$, then the quotient must be?**

○ A: $x^3 + 5x^2 + 17$ ○ B: $x^3 + 3x + 5$

○ C: $x^3 + 7x^2 + 17x + 29$ ○ D: $x^3 + 17x + 29$

7. **If $x^3 + x^2 + x + 1 = 0$ then possible values of x are?**

○ A: 1, i, -I ○ B: -1, i^2, -i

○ C: -1, i, -I ○ D: None of the above.

8. **If $x + 1/x = 1$ then $x^3 + 1/x^3$ is equal to**

○ A: 1 ○ B: -1

○ C: 2 ○ D: -2

9. **If two of the four roots of 625 are 5 and 5i then the other two roots are?**

○ A: -5, -5i ○ B: 5, 5i

○ C: -25, -25i ○ D: None of the above.

10. **$(x + \omega y) \cdot (x + \omega^2 y) = ?$**

○ A: $x^2 - 2xy + y^2$ ○ B: $x^2 + 2xy + y^2$

○ C: $x^2 + xy + y^2$ ○ D: $x^2 - xy + y^2$

11. **If 5 + i be one of the roots of a given equation f(x) = 0 with real coefficients, then the lowest degree of such an equation must be?**

○ A: 2 ○ B: 3

○ C: 6 ○ D: Not enough information given to answer the question.

12. $\left(\frac{-1-\sqrt{3}i}{2}\right)^2$ **= ?**

○ A: $\left(\frac{-1+\sqrt{3}i}{2}\right)$

○ B: 1

○ C: $\left(\frac{-1+i}{2}\right)$

○ D: $\left(\frac{-1-i}{2}\right)$

13. If α, β are the roots of the equation $x^2 + x + 1 = 0$, the equation whose roots are α / β and β / α is?

○ A: $x^2 + x + 1 = 0$

○ B: $x^2 - x + 1 = 0$

○ C: $x^2 + x - 1 = 0$

○ D: $x^2 - x - 1 = 0$

14. $1 + \omega^4 = ?$

○ A: $1 + \omega$

○ B: $-\omega^2$

○ C: 1

○ D: Both A and B.

15. if $x + y = 7$ and $x^2 - xy + y^2 = 13$; What are the values of x and y?

○ A: (1,2) (-1,3)

○ B: (4,5) (-2,3)

○ C: (1,5) (2,5)

○ D: (4,3) (3,4)

16. An expression of the type $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 = 0$ is called

○ A: Polynomial of degree

○ B: Polynomial of degree 1

○ C: Polynomial of degree 2

○ D: Polynomial of degree n

17. If the equations $x^2 + ax + b = 0$ and $x^2 + Ax + B = 0$ have a common root say ' t ', ' t ' must be equal to?

○ A: (B - b) / (a - A)

○ B: (a - A) / (b - B)

○ C: (a + A) / (B - b)

○ D: None of the above.

18. If $2 + i\sqrt{3}$ is a root of the equation $x^2 + p x + q = 0$ (p & q being real), then p + q is equal to?

○ A: 3

○ B: -3

○ C: $\sqrt{3}$

○ D: $-\sqrt{3}$

19. The roots of the equation $12x^2 + mx + 5 = 0$ will be in the ratio 3 : 2, if m is equal to

○ A: 1/12

○ B: 5/12

○ C: $5\sqrt{10}$

○ D: $5/12 \sqrt{10}$

Sequences & Series

TEST 1

1. **If a series has a common ratio between two terms. It is called?**

○ A: Geometric series.
○ B: Arithmetic series
○ C: Harmonic series
○ D: None of the above.

2. **Sum of infinite GP does not exist if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: Both B & C.

3. **Sum of infinite geometric series exists if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

4. **If the sum of first n positive integers is 1/5 times the sum of their square. Then n equals?**

○ A: 5
○ B: 6
○ C: 7
○ D: 8

5. **Find next term for the series,**
1, -3, 5, -7, 9, ?

○ A: -9
○ B: -11
○ C: -13
○ D: -15

6. **If AP has $a=1$, $t_n = 20$ and $S_n = 399$, then the value of n is?**

○ A: 20
○ B: 32
○ C: 38
○ D: 40

7. **The 6th term of HP is 1/61 and tenth term is 1/105. The first term of HP is?**

○ A: 1/39
○ B: 1/28
○ C: 1/17
○ D: 1/6

8. **What are the number of terms in an AP if $a_1=3$, $d=7$ and $a_n=59$.**

○ A: 6
○ B: 7
○ C: 8
○ D: 9

9. **If first two terms of H.P are 1/2 and 1/4 then fourth term is?**

○ A: 1/6
○ B: 1/8
○ C: 1/10
○ D: 1/12

10. **Write the first four terms of the arithmetic sequence if $a_1 = 5$ and other three consecutive terms are** 23,26,29.?

○ A: 5, 10, 15, 20
○ B: 5,8,11,14
○ C: 5, 9, 13, 17
○ D: None of the above.

11. 3, 6, 12 is?

○ A: AP ○ B: GP

○ C: HP ○ D: None of the above.

12. 5th term of the GP 3, 6, 12 is?

○ A: 32 ○ B: 36

○ C: 42 ○ D: 48

13. If the first and the sixth terms of a G.P are 2 and 64, then its common ratio is?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

14. If $x = 1 + y + y^2$ .... infinity. The value of y is?

○ A: $x / (x-1)$ ○ B: $x / (1-x)$

○ C: $(x-1) / x$ ○ D: $(1-x) / x$

15. Arithmetic mean is given by formula?

○ A: $(ab)^{1/2}$ ○ B: $ab / (a + b)$

○ C: $(a + b) / 2$ ○ D: None of the above.

16. Arithmetic mean between $1 - x + x^3$ and $1 + x + x^3$ is?

○ A: $1 + x^3$ ○ B: $1 - x^3$

○ C: $1 + x$ ○ D: $1 - x$

17. nth term of GP is given by formula?

○ A: $a_n=a_1r^n$ ○ B: $a_n=a_1r^{n+1}$

○ C: $a_n=a_1r^{n-1}$ ○ D: $a_n=a_1r^{n-2}$

18. The harmonic mean of $a / (1 - ab)$ and $a / (1 + ab)$ is?

○ A: $a / (1 - ab)$ ○ B: $a / (1 - a^2b^2)$

○ C: a ○ D: $1 / (1 - a^2b^2)$

19. An infinite GP is oscillatory if?

○ A: $|r| < 1$ ○ B: $|r| > 1$

○ C: $|r| = 1$ ○ D: $|r| = -1$

20. What is the geometric mean between -2i and 8i?

○ A: ±4 ○ B: ±4i

○ C: 3i ○ D: 8i

TEST 2

1. If the numbers a, b, c, d, e form an A.P then the value of a - 4b + 6c - 4d + e is?

○ A: 1
○ B: 2
○ C: 0
○ D: None of the above.

2. $\sum_{k=1}^{n} k^2 = ?$

○ A: n
○ B: n(n+1) / 2
○ C: n(n+1)(2n+1) / 6
○ D: $[\ n(n+1)/2\ ]^2$

3. If 5 is HM between 2 and b then the value of b is?

○ A: 12.5
○ B: 10
○ C: -10
○ D: 8

4. What is the common ratio if $a_4 = 8/27$ and $a_7 = -64/729$?

○ A: ¼
○ B: -1/3
○ C: -2/3
○ D: -3/7

5. If x, y, z are in A.P, then (x + 2y - z) (2y + z - x) (z + x - y) = ?

○ A: xyz
○ B: 2xyz
○ C: 4xyz
○ D: 6xyz

6. If | x | < 1 and $y = x + x^2 + x^3 + \ldots \ldots \infty$, then x is equal to?

○ A: 0
○ B: xy
○ C: y / (1-y)
○ D: y / (1+y)

7. The sum of the series √3 + 1/√3 + 1/3√3 .... ∞ is equal to ?

○ A: √3 / 2
○ B: 3√3 / 2
○ C: 3
○ D: √3

8. If a, b, c are in A.P as well as in G.P then?

○ A: a = b ≠ c
○ B: a ≠ b = c
○ C: a ≠ b ≠ c
○ D: a = b = c

9. The nth terms of the two series: 3 + 10 + 17 + ------- and 63 + 65 + 67+......... are equal. Then the value of n is?

○ A: 9
○ B: 13
○ C: 19
○ D: 21

10. If the quadratic equation $(b^2 + c^2)x^2 - 2(a + b)cx + (c^2 + a^2) = 0$ has equal roots, then

○ A: a, b, c are in G.P
○ B: a, b, c are in A.P
○ C: a, c, b are in G.P
○ D: a, c, b are in A.P

The harmonic mean of the roots of the equation

11. $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + 8 + 2\sqrt{5} = 0$ **is**

○ A: 2
○ B: 4
○ C: 6
○ D: 8

12. If $a_n = (-3)(2/5)^n$ what the value of a_1 and r for the GP?

○ A: -6/5 and 2/5
○ B: 6/5 and 2/5
○ C: 3/8 and 1/5
○ D: -3/8 and 1/5

13. If in an AP $a_{25} - a_{20} = 45$, then d is equal to?

○ A: 9
○ B: -9
○ C: 18
○ D: 23

14. If $\frac{1}{x+y}$, $\frac{1}{2y}$, $\frac{1}{y+z}$ are in H.P, then x, y, z are in

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

15. For AP $T_{18} - T_8 = ?$

○ A: d
○ B: 2d
○ C: 10d
○ D: 26d

16. The value of the recurring fraction $0.0\overline{102}$ **is?**

○ A: 17 / 1665
○ B: 102 / 9999
○ C: 102 / 10000
○ D: 34 / 3339

17. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + 100^3)^{1/2} \div 100$ is?

○ A: √100
○ B: 100
○ C: 100.5
○ D: 50.5

18. If a, b, c, d, e, f are A.Ms (Arithmetic Means) between 2 and 12, then a + b + c + d + e + f is equal to?

○ A: 14
○ B: 42
○ C: 64
○ D: 82

19. The number of terms between 30 and 530, which are divisible by 11, is?

○ A: 30
○ B: 40
○ C: 46
○ D: 52

20. Find the sum of infinite GP 2, √2, 1 .....

○ A: $4 + \sqrt{2}$
○ B: $2 + 2\sqrt{2}$
○ C: $4 + 2\sqrt{2}$
○ D: $2 + 7\sqrt{2}$

TEST 3

1. If $a^x = b^y = c^z = d^t$ and a, b, c, d are in G.P then x, y, z, and t are in?

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

2. If a^2, b^2, c^2 are in A.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in

○ A: G.P ○ B: H.P

○ C: A.P ○ D: None of the above.

3. If mth term of H.P is n and nth term is m, then (m+n)th term is?

○ A: mn / (m+n) ○ B: m / (m+n)

○ C: n / (m+n) ○ D: (m-n) / (m+n)

4. If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

5. If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then a, b, c, d are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

6. If m^{th} term of an A.P is n and n^{th} term is m, then the $(m + n)^{th}$ term is ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

7. If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, and $b \neq a + c$, then a, b, c are

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

8. If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} (ab)^n$, where $|a|, |b| < 1$, then

○ A: xyz = x + y + z ○ B: xy + z = xz + yz

○ C: xy + yz = xz + y ○ D: xy + xz = yz + x

9. If $a^x = b^y = c^z$ and a, b, c are in G.P then x, y, z are in?

○ A: A.P ○ B: H.P

○ C: G.P ○ D: None of the above.

10. If a, b, c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point and that point is

○ A: (-1. -2) ○ B: (-1, 2)

○ C: (1, -2) ○ D: (1, 2)

11. The harmonic mean of two numbers is 4. Their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 27$, the numbers are

○ A: 2, 15 ○ B: 9, 12

○ C: 6, 3 ○ D: 4, 8

12. Between 1 and 31 are inserted m arithmetic means, so that the ratio of the 7th and $(m-1)$th means is 5 : 9. Then the value of m is

○ A: 12 ○ B: 13

○ C: 14 ○ D: 15

13. If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to

○ A: 75 ○ B: 430

○ C: 864 ○ D: 900

14. If the sum of an infinite G.P is 3 and the sum of the squares of its terms is also 3, then its first term and common ratio are?

○ A: 3/2, ½ ○ B: 4/7, 1/3

○ C: 1, 1/2 ○ D: 1/8, 3/8

15. If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P., then

○ A: p, q, r are in A.P ○ B: q^2, p^2, r^2 are in A.P

○ C: p^2, q^2, r^2 are in A.P ○ D: p, r, q are in A.P

16. If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x \, dx$, then $I_1, I_2, I_3, \ldots\ldots$ are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

17. The sum of integers from 1 to 100 which are not divisible by 3 or 5 is?

○ A: 2438 ○ B: 4745

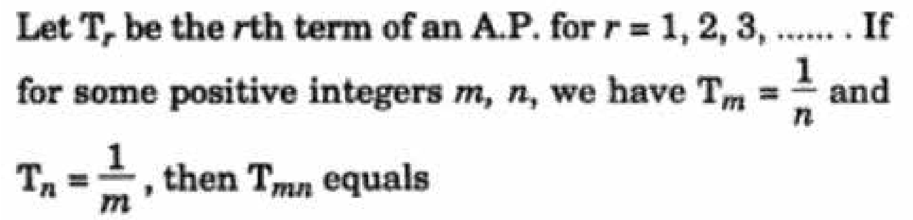
○ C: 2317 ○ D: 2632

18. The sum of all the odd numbers of four digits which are divisible by 9 is ?

○ A: 11007000	○ B: 4362000
○ C: 6743000	○ D: 2754000

19. The sum of 100 terms of the series $1^2 - 2^2 + 3^2 - 4^2 +$ .... is?

○ A: -5050	○ B: -4720
○ C: -3870	○ D: -2490

20. 

Let T_r be the rth term of an A.P. for $r = 1, 2, 3, \ldots\ldots$. If for some positive integers m, n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then T_{mn} equals

○ A: 1	○ B: 0
○ C: 1 / mn	○ D: 1/m + 1/n

TEST 4

1. $1 + 2 + 3 + 4 + \ldots\ldots n = ?$

○ A: n ○ B: $n(n+1) / 2$

○ C: $n(n+1) / 6$ ○ D: $n(n+1)(2n+1) / 6$

2. If 5 and 8 are two AMs between a and b. What is the value of a and b?

○ A: 3, 14 ○ B: 2, 11

○ C: 4, 13 ○ D: 2, 16

3. If a, b, c, d, e, f are in arithmetic progression, then e - c = ?

○ A: $2(c - a)$ ○ B: $2(d - c)$

○ C: $2(f - d)$ ○ D: $d - c$

4. If a_{n-2} term of an AP is 3n-11. What is the nth term of the sequence?

○ A: $2n - 8$ ○ B: $3n + 8$

○ C: $3n - 5$ ○ D: $7n + 12$

5. If $|r| < 1$ then the sum of n terms of GP are given by?

○ A: $S_n = a_1 (1 + r^n) / (1 - r)$ ○ B: $S_n = a_1 (1 - r)^n / (1 - r)$

○ C: $S_n = a_1 (1 - r^n) / (1 - r)$ ○ D: $S_n = a_1 (1 - r^n) / (1 + r)$

6. **The first term of an A.P of consecutive numbers is $p^2 + 1$. The sum of $2p + 1$ terms of this series can be expressed as?**

○ A: $(p+1)^2$ ○ B: $(p+1)^3$

○ C: $(2p + 1) * (p+1)^2$ ○ D: $p^3 + (p+1)^3$

7. The sum of first n terms of the series 1/2 + 3/4 + 7/8 + 15/16 + ... is equal to?

○ A: $2^n - n + 1$ ○ B: $1 - 2^n$

○ C: $n + 2^{-n} - 1$ ○ D: $2^n - 1$

8. The value of $0.4\overline{23}$ is

○ A: 419 / 999 ○ B: 419 / 990

○ C: 423 / 1000 ○ D: None of the above.

9. If $|r| > 1$ then the sum of n terms in a GP are given by formula?

○ A: $S_n = a_1 (r^n - 1) / (r + 1)$ ○ B: $S_n = a_1 (r^n - 1) / (1 - r)$

○ C: $S_n = a_1 (1 - r^n) / (1 - r)$ ○ D: $S_n = a_1 (r^n - 1) / (r - 1)$

10. Fine the 7th term of the series 2, 6, 11, 17, ...

○ A: 41 ○ B: 47

○ C: 53 ○ D: 62

11. Arithmetic mean between $3\sqrt{5}$ and $5\sqrt{5}$ is?

○ A: $4\sqrt{5}$

○ B: $8\sqrt{5}$

○ C: $5\sqrt{15}$

○ D: $15\sqrt{5}$

12. Harmonic mean between 3 and 7 is?

○ A: 7/3

○ B: 3/7

○ C: 21/5

○ D: 32/7

13. If k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an A.P, then k is equal to?

○ A: 0

○ B: 1

○ C: 2

○ D: 3

14. If sum of the series $1 + \frac{3}{x} + \frac{9}{x^2} + \frac{27}{x^3} + \ldots \infty$ is a finite number, then

○ A: $x < 3$

○ B: $x > 1/3$

○ C: $x < 1/3$

○ D: $x > 3$

15. If G.P consists of even number of terms and sum of all terms is equal to 5 times the sum of terms in odd places (meaning term 1, 3, 5, ...) then common ratio will be?

○ A: 3

○ B: 4

○ C: 5

○ D: 6

16. If a series has common difference between two consecutive numbers. It is called?

○ A: Geometric progression

○ B: Arithmetric progression

○ C: Harmonic progression

○ D: None of the above.

17. Which term of the AP 92, 88, 84, 80 ... is zero?

○ A: 22

○ B: 23

○ C: 24

○ D: 34

18. The angles of a triangle are in A.P. If the least angle is 30^0 the greatest angle is?

○ A: 45^0

○ B: 60^0

○ C: 75^0

○ D: 90^0

19. If a, b, c are in A.P, b - a, c - b and a are in G.P, then a : b : c is ?

○ A: 1:2:3

○ B: 1:4:9

○ C: 2:3:4

○ D: 1:2:4

20. If n arithmetic means are added between 2 and 38 and the sum of resulting series is 200. Then the value of n is?

○ A: 6

○ B: 8

○ C: 9

○ D: 10

Probability & Permutations

TEST 1

1. If there are 3 roads from Lahore to Gujranwala and 4 roads from Gujranwala to Islamabad. How many different routes are there from Lahore to Islamabad?

○ A: 4 ○ B: 10

○ C: 12 ○ D: 18

2. If $^nC_8 = {}^nC_{12}$, What is value of n?

○ A: 5 ○ B: 10

○ C: 20 ○ D: Cannot be determined.

3. If the probability to score a century in any given match is 0.04. How many centuries the batsmen would make in 50 matches?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

4. When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is?

○ A: 1/216 ○ B: 8/27

○ C: 130/216 ○ D: 125/216

5. A club has 20 members and you want to select the president and vice president for the club. How many different outcomes are possible if president and vice president cannot be the same person?

○ A: 370 ○ B: 380

○ C: 390 ○ D: 398

6. There are n points on a circle. The number of straight lines obtained by joining them is?

○ A: $^nC_3$ ○ B: $^nC_2$

○ C: $^nC_2$ - n ○ D: ^nC_n

7. Probability of occurance for one of the four equally likely events would be?

○ A: 0 ○ B: 0.25

○ C: 0.75 ○ D: 1

8. What is the probability of getting a sum 9 from two throws of a dice?

○ A: 1/6 ○ B: 1/8

○ C: 1/9 ○ D: 1/12

9. The number of ways of painting the faces of a cube with six different colours is?

○ A: 1 ○ B: 6

○ C: 6! ○ D: None of the above.

10. Which of the following is true?

n! = n(n-1)!, 0! = 0, 4! = 4.3.2.1

○ A: iii only ○ B: i and ii only

○ C: i and iii only ○ D: i, ii and iii

11. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

○ A: 5/7 ○ B: 2/7

○ C: 3/5 ○ D: 2/5

12. A husband and a wife appear in an interview for the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that none of them will be selected?

○ A: 12/35 ○ B: 34/35

○ C: 24/35 ○ D: None of the above.

13. If you role a dice twice. What is the probability that you would get 6 both the times?

○ A: 1/3 ○ B: 1/6

○ C: 1/12 ○ D: 1/36

14. If A and B are two independent sets then P(A∩B) = ?

○ A: P(A) + P(B) ○ B: P(A) * P(B)

○ C: P(A) + P(B) – P(A∪B) ○ D: P(A)

15. The number of diagonals of a hexagon is?

○ A: 6 ○ B: 9

○ C: 15 ○ D: 18

16. The number of ways of selecting 2 candidates out of 5 equally qualified candidates for a post is?

○ A: 10 ○ B: 8

○ C: 5 ○ D: 20

17. P, Q, R and S are to give lectures to an audience. The organizer can arrange the order of their presentations in how many ways?

○ A: 4 ○ B: 8

○ C: 12 ○ D: 24

18. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: (p+q)! ○ B: (p+q)! / p!

○ C: (p+q)! / q! ○ D: (p+q)! / p!q!

19. A set with all possible outcomes of an experiment is called?

○ A: Probability function ○ B: Event space

○ C: Sample space ○ D: Both B and C.

20. 9! / (6!3!) = ?

○ A: 72 ○ B: 84

○ C: 96 ○ D: 108

TEST 2

1. The total number of different combinations of names which can be made from the letters of the word MISSISSIPPI, using all the letters at a time?

○ A: 4!x 4!x 2!
○ B: 11! / (4!x 4!x 2!)
○ C: 11! / (10!)
○ D: 11!

2. A work is given to 3 men and their probabilities for doing the work are 1/7, 1/4, 1/6 respectively. Find the probability that the work is done?

○ A: 39/84
○ B: 1/168
○ C: 167/168
○ D: 23/89

3. Three identical dice are rolled. The probability that the same number will appear on each of them is?

○ A: 1/6
○ B: 1/36
○ C: 1/216
○ D: 3/216

4. The number of subsets of a set containing n distinct objects is?

○ A: ${}^nC_1 + {}^nC_2 + {}^nC_3 + \ldots\ldots + {}^nC_n$
○ B: ${}^nC_0 + {}^nC_1 + {}^nC_2 + \ldots\ldots + {}^nC_n$
○ C: $2^n + 1$
○ D: None of the above.

5. The odds against drawing 2 red balls from a bag containing 3 red and 2 white balls is?

○ A: 1 : 2
○ B: 3 : 7
○ C: 7 : 3
○ D: 3 : 2

6. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that either Hafeez or Afridi would face the first ball?

○ A: 2/11
○ B: 1/11
○ C: 1/121
○ D: 1/110

7. There are 8 persons in the room. 4 are men and 4 are women. If two persons are selected, what is the probability that both of them would be men?

○ A: ½
○ B: 1/4
○ C: 3/7
○ D: 3/14

8. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is?

○ A: 21/46
○ B: 25/117
○ C: 1/50
○ D: 3/23

9. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that neither Hafeez nor Afridi would face the first ball?

○ A: 2/11
○ B: 1/11
○ C: 9/11
○ D: 10/11

10. An rack has 5 black and 4 white ties. A boy pulls out 2 ties at random. The probability that 2 are of the same colour is?

○ A: 4/9
○ B: 5/9
○ C: 5/8
○ D: 3/8

11. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

○ A: 1/14 ○ B: 1/8

○ C: ¾ ○ D: 4/7

12. For any two events A and B, $P(A \cap B)$ is?

○ A: Less than $P(A) + P(B) – 1$ ○ B: Greater than $P(A) + P(B)$

○ C: $P(A) + P(B) - P(A \cup B)$ ○ D: $P(A) + P(B) + P(A \cup B)$

13. The probability that a man will live 10 more years is 1/4 and the probability that his wife will live 10 more years is 1/3. The probability that neither of them will be alive in 10 years is?

○ A: 1/12 ○ B: 11/12

○ C: 7/12 ○ D: 1/2

14. A box contains 2 white, 3 black and 4 red balls. The number of ways in which 3 balls can be drawn from the box, so that at least one of the balls is black is?

○ A: 45 ○ B: 84

○ C: 64 ○ D: 32

15. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

○ A: 10/21 ○ B: 11/21

○ C: 2/7 ○ D: 5/7

16. The chances of wining of two race horses are 1/3 and 1/6 respectively. What is the probability that atleast one will win, when the horses are running in different races?

○ A: ½ ○ B: 1/8

○ C: 1/18 ○ D: 4/9

17. How many signal can be made with 4 signs using any number of signs at a time?

○ A: 24 ○ B: 60

○ C: 64 ○ D: 82

18. How many words can be formed by taking four different letters of the word MATHEMATICS?

○ A: 7920 ○ B: 1680

○ C: 1260 ○ D: 68

19. ^nP_r = ?

○ A: $^nC_r * r!$ ○ B: $^nC_{n-r} * r!$

○ C: $^nC_{n-r}$ ○ D: Both A and B.

20. If the probability that a batsmen scores a century in any given match is 0.3. On average how many matches the batsmen would play to score his first century?

○ A: 2 ○ B: 4

○ C: 15 ○ D: 30

TEST 3

1. A matrix is chosen at random from the set of all 2 x 2 matrices with elements 0 and 1 only. The probability that the value of the determinant of the matrix chosen is positive is?

○ A: 1/8 ○ B: 3/16

○ C: 1/16 ○ D: 13/16

2. Six identical coins are arranged in a row. The number of ways, in which the number of tails is equal to the number of heads is?

○ A: 20 ○ B: 24

○ C: 36 ○ D: 48

3. 3 books of english and 5 books of urdu are randomly placed on a shelve. What is the probability that books on the same subject are together?

○ A: 1/56 ○ B: 1/7

○ C: 2/8! ○ D: 1/28

4. When a dice is rolled probability that even number or number greater than 4 appear is?

○ A: 5/6 ○ B: 1/6

○ C: 2/3 ○ D: 1/3

5. There are 10 lamps of different colors in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is?

○ A: 1025 ○ B: 1024

○ C: 1023 ○ D: 10!

6. Eight chairs are numbered 1 to 8. 2 women and 3 men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is?

○ A: $^4C_3 . ^4C_2$ ○ B: $^4C_2 . ^4P_2$

○ C: $^4P_2 . ^4P_3$ ○ D: $^4P_2 . ^6P_3$

7. Find the number of ways in which a mixed double tennis game can be arranged between 10 players consisting of 6 men and 4 women?

○ A: 190 ○ B: 180

○ C: 90 ○ D: 48

8. There are 18 children in the room including 9 boys and 9 girls. You call a child to give a sweet and the child goes back to the room and can potentially be chosen again. If total number of sweets are 4, what is the probability that atleast one boy gets the sweet?

○ A: 1/16 ○ B: 15/16

○ C: 9/16 ○ D: 7/18

9. If five digit numbers are formed from 1,2,3,4,8. What is the probability of forming a number with 2 and 8 not next to each other?

○ A: 2/5 ○ B: 2/7

○ C: 5/7 ○ D: 3/5

10. In how many ways 8 books including 2 English books can be arranged together such that English books are not together?

○ A: 5040 ○ B: 10080

○ C: 30240 ○ D: 40320

A person wishes to make up as many different parties as he can out of his 20 friends, such that each party consists of the same number of persons. The number of friends he should invite at a time is?

○ A: 5 ○ B: 8

○ C: 10 ○ D: 12

11. Pakistan plays two matches each with West Indies and Australia. In any match, the probabilities of Pakistan getting points 0, 1 and 2 are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of Pakistan getting at least 7 points is?

○ A: 0.8750 ○ B: 0.0875

○ C: 0.0625 ○ D: 0.0250

12. In how many ways 5 boys and 4 girls can be seated in a bench such that boys and girls occupy alternate seats?

○ A: 1240 ○ B: 1560

○ C: 2590 ○ D: 2880

13. A man invites 4 men and 4 women to a party. In how many ways can they sit around a round table, so that no two men are together?

○ A: 6 ○ B: 24

○ C: 132 ○ D: 144

14. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:?

○ A: 3/22 ○ B: 1/22

○ C: 2/91 ○ D: 3/91

15. Two different numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is? Hint: $a^2 - b^2$ is divisible by 3 if both the numbers are divisible by 3 or none of them is divisible by 3.

○ A: 2/87 ○ B: 19/87

○ C: 37/87 ○ D: 47/87

16. ${}^{13}C_9 - {}^{12}C_8$ is equal to?

○ A: ${}^{13}C_7$ ○ B: ${}^{13}C_9$

○ C: ${}^{12}C_9$ ○ D: None of the above.

17. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 points lying on them respectively. The number of triangles that can be constructed using these points as vertices is?

○ A: 205 ○ B: 208

○ C: 220 ○ D: 260

18. If A and B are two events, such that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\overline{B}) = 1/2$, then the events A and B are?

○ A: Independent ○ B: Dependent

○ C: Disjoint ○ D: None of the above.

19. How many necklaces can be made from 6 beads of different colors?

○ A: 60 ○ B: 120

○ C: 360 ○ D: 720

TEST 4

1. A carton contains 20 bulbs, out of which 5 are defective. If a sample of 3 bulbs is selected at random, find the probability that 2 of them are defective bulbs?

○ A: 1/16 ○ B: 3/64

○ C: 9/64 ○ D: 2/64

2. The number of ways in which 12 balls can be divided between two friends, one receiving 8 and the other 4 is?

○ A: 12! / 8!4! ○ B: 12!2! / 8!4!

○ C: 12! / 8!4!2! ○ D: 8!4!

3. The probability that A can solve a problem is 2/3 and the probability that B can solve the problem is 3/4. The probability that at least one of A and B will be able to solve the problem is?

○ A: 11/12 ○ B: 5/12

○ C: 1/12 ○ D: 1/2

4. Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 1 heads after six tosses?

○ A: 0.08 ○ B: 0.17

○ C: 0.30 ○ D: 0.44

5. How many 5 digit number divisible by 2 can be formed from 1,2,3,5,7?

○ A: 24 ○ B: 48

○ C: 124 ○ D: 132

6. Out of 40 consecutive integers, two are chosen at random. The probability that their sum is odd is?

○ A: 1/200 ○ B: 1/2

○ C: 20/39 ○ D: 1/20

7. Cards are drawn one by one at random from a well shuffled pack of 52 cards. What is the probability that there is only one ace in first 17 cards?

○ A: $({}^{4}C_1 * {}^{48}C_{16}) / {}^{52}C_{17}$ ○ B: ${}^{48}C_{16} / {}^{52}C_{17}$

○ C: $({}^{4}C_1 + {}^{48}C_{16}) / {}^{52}C_{17}$ ○ D: ${}^{4}C_1 / {}^{52}C_{17}$

8. H.C.F of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: None of the above.

9. The number of arrangements which can be made using all the letters of the word LAUGH, if the vowels are adjacent is?

○ A: 120 ○ B: 24

○ C: 48 ○ D: 56

10. On the occasion of Eid festival, each student of a class sends greeting cards to others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is?

○ A: ${}^{20}C_2$ ○ B: $2 \times {}^{20}C_2$

○ C: $2\ {}^{20}P_2 - 1$ ○ D: None of the above.

11. There are 4 letter boxes in a post office. In how many ways can a man post 8 different letters?

○ A: 4^8 ○ B: 8^4

○ C: 8! ○ D: 4!

12. 5 men and 6 women have to be seated in a straight row, so that no two women are together. Find the number of ways in which this can be done?

○ A: 43200 ○ B: 39600

○ C: 36000 ○ D: 86400

13. The number of ways in which 5 beads of different colours can form a necklace is?

○ A: 6 ○ B: 12

○ C: 24 ○ D: 60

14. L.C.M. of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: n

15. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

○ A: ¾ ○ B: 1/3

○ C: 7/19 ○ D: 9/21

16. ${}^{n}P_{n}$ = ?

○ A: ${}^{n}C_{n}$ ○ B: ${}^{n+1}C_{n}$

○ C: n ○ D: n!

17. Everybody in a room shakes hand with every other person. The total number of hand shakes is 66. Find the total number of persons in the room?

○ A: 9 ○ B: 10

○ C: 11 ○ D: 12

18. A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 1/3, 1/4 respectively. What is the probability that the problem will be solved?

○ A: ¼ ○ B: 1/24

○ C: 7/24 ○ D: 3/4

19. The number of ways in which a mixed double game can be arranged from among nine married couples, if no husband and wife play in the same game is?

○ A: 1512 ○ B: 756

○ C: 3024 ○ D: 3298

20. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: C(p + q, q) ○ B: P(p + q, p)

○ C: P(p + q, q) ○ D: C(p + q, p - q)

21. If you toss four coins, what is the probability of getting two heads and two tails?

○ A: 3/16 ○ B: 1/8

○ C: 2/8 ○ D: 3/8

22. When three dice are thrown, what is the probability of getting the same number on three of them?

○ A: 1/216 ○ B: 1/36

○ C: 5/36 ○ D: 1/6

23. The number of digits that can be formed from 2, 3, 5, 7, 8 with 2 and 8 next to each other is?

○ A: 24 ○ B: 36

○ C: 48 ○ D: 72

24. An employer wants to hire 3 analysts from 6 applicants and 2 designers from 4 applicants. What is the total number of ways in which she can make the selection?

○ A: 1490 ○ B: 132

○ C: 120 ○ D: 60

25. If ${}^{n}C_{r-1} = 36$, ${}^{n}C_{r} = 84$ and ${}^{n}C_{r+1} = 126$, then r is equal to?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

26. Four cars are racing in a circuit. What are the total number of permutations with which they can cross the finish line?

○ A: 4 ○ B: 16

○ C: 18 ○ D: 24

27. The probability that the 1st day of a random chosen month is a Friday is?

○ A: 1/7 ○ B: 1/12

○ C: 1/19 ○ D: 1/84

28. m parallel lines in a plane are intersected by a family of n parallel lines. The total number of parallelograms so formed is?

○ A: (m-1)(n-1) / 4 ○ B: mn/4

○ C: m(m-1)(n-1)/2 ○ D: mn(m-1)(n-1)/4

29. There are 10 girls and 20 boys in a class. 5 girls and 10 boys have blue eyes. Find the probability that one student chosen at random is a girl and has blue eyes?

○ A: 2/3 ○ B: 5/6

○ C: 1/6 ○ D: 1/2

30. If $P(A \cup B) \neq P(A) + P(B)$ Then;

○ A: A and B are disjoint sets. ○ B: A and B are Independent sets

○ C: A and B are overlapping sets ○ D: A and B are unit event sets.

31. From a set of 17 cards numbered 1 to 17, one card is drawn at random. The probability that the number is divisible by 3 or 7 is?

○ A: 2/17 ○ B: 5/17

○ C: 7/17 ○ D: 9/17

32. The number of times the digit 3 will appear listing the integers from 1 to 1000 is?

○ A: 271 ○ B: 280

○ C: 297 ○ D: 300

33. Three unbiased coins are tossed. What is the probability of getting atleast one head?

○ A: ¾ ○ B: 1/4

○ C: 1/8 ○ D: 7/8

Induction & Binomial Theorem

TEST 1

1. **Which of the following is not true regarding the binomial expansion of $(a + x)^n$?**

   ○ A: Total number of terms is n + 1.

   ○ B: Sum of exponents of a and x in each term of expansion is equal to n.

   ○ C: Exponent of a decrease from n to n - 1.

   ○ D: Exponent of x increase from 0 to n.

2. **What is the coefficient of the third term for $(x + y)^5$?**

   ○ A: 2　　○ B: 5

   ○ C: 8　　○ D: 10

3. **What is the general term of $(x + 2/x)^4$?**

   ○ A: $C(4,k)\ 2^k\ x^{4-2k}$　　○ B: $C(4,k)\ 2^k\ x^{2-2k}$

   ○ C: $C(4,k)\ 2^k\ x^{4-k}$　　○ D: $C(4,k)\ 2^{2k}\ x^{2-2k}$

4. **$(x+y)^4 = ?$**

   ○ A: $x^4 + 2x^3y + 4x^2y^2 + 2xy^3 + y^4$　　○ B: $x^4 + 4x^3y + 6x^2y^2 + 2xy^3 + y^4$

   ○ C: $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$　　○ D: $x^4 + 4x^3y + 8x^2y^2 + 4xy^3 + y^4$

5. **If n is odd, the middle term in the expansion of $(a + x)^n$ is?**

   ○ A: n/2 + 1　　○ B: n/2 and n/2 + 1

   ○ C: (n + 1) / 2 and (n + 2) / 2　　○ D: (n + 1) / 2 and (n + 3) / 2

TEST 2

1. The method of mathematical induction was devised by?

○ A: David Hilbert
○ B: Francesco Mourolico
○ C: Issac Newton
○ D: Carl F. Gauss

2. What is the 3rd term in the binomial expansion of

3. $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^{6}$

○ A: -20
○ B: 20
○ C: 15 a/x
○ D: 15 x/a

4. Third term in the expansion of $(1 - x)^{-1}$ is?

○ A: x^2
○ B: $2x^2$
○ C: $-x^2$
○ D: $-2x^2$

5. Which of the following would have even number of terms in its expansion?

○ A: $(a + x)^{20}$
○ B: $(a + x)^{90}$
○ C: $(a + x)^{51}$
○ D: Both A and B.

6. What is the value of $(0.97)^6$ using only the first three terms of binomial expansion?

○ A: 0.8246
○ B: 0.8318
○ C: 0.8335
○ D: 0.8452

7. How many terms are there in the expansion of $(a + x)^{100}$

○ A: 99
○ B: 100
○ C: 101
○ D: Cannot determine.

8. What is the middle term in the expansion of $(4x – y)^8$?

○ A: 19240 x^4y^4
○ B: 17920 x^4y^4
○ C: 56220 x^2y^2
○ D: 18420 x^4y^4

9. What is the contant term in the expansion of $(1/z^3 + z^2)^5$?

○ A: 10
○ B: 16
○ C: 18
○ D: 24

10. What is the fourth term in the expansion of $(1 - x)^{1/2}$?

○ A: - ¼
○ B: - 1/2 x
○ C: -1/8 x^2
○ D: - 1/16 x^3

TEST 3

1. For which x the 5th expansion member equals $M_5 = 105$?

$$\left(\frac{1}{2\sqrt{x}} - \frac{1}{2}\right)^{10}$$

○ A: ½ ○ B: 1/4

○ C: 1/8 ○ D: 2

2. If x is the sum of the odd coefficients and y is the sum of the even coefficients in a binomial expansion. Then?

○ A: x = y/2 ○ B: x = y

○ C: x = 2y ○ D: None of the above.

3. The rule of binomial expansion for $(a + x)^n$ is valid if?

○ A: a and x both are real numbers. ○ B: a is real and x can be real or complex.

○ C: x is real and a can be real or complex. ○ D: Both a and x can be real or complex.

4. Find out the member of the binomial expansion of $(x + x^{-1})^8$ not containing x?

○ A: 7th ○ B: 6th

○ C: 5th ○ D: 4th

5. If in the expansion of $(x + y^3)^n$ the coefficient of the 3rd term is greater by 44 than the 2nd term. The value of n is?

○ A: 8 ○ B: 9

○ C: 10 ○ D: 11

6. Which term in the expansion of $(x - 2/x^2)^{13}$ has term x^{-2} ?

○ A: 5th ○ B: 6th

○ C: 7th ○ D: 8th

7. The sum of coefficients in the binomial expansion is equal to?

○ A: 2^n ○ B: 2^{2n}

○ C: 2^{2n-1} ○ D: 2^{n-1}

8. What is the middle term in the expansion of $(x + 1/x)^{2n}$? Where $x \neq 0$.

○ A: C(2n,n) ○ B: C(2n,n) x

○ C: C(2n,n) x^{2n} ○ D: C(2n,n) x^{3n}

9. What is the constant term in the expansion of $(x^2 - 2/x^2)^8$?

○ A: 1080 ○ B: 1120

○ C: 2400 ○ D: 2480

10. Which member of the binomial expansion of $(2x^3 + x^{-1})^{10}$contains x^6?

○ A: 6th ○ B: 7th

○ C: 8th ○ D: 9th

11. What is the term containing x^{14} in the expansion of $(x^3 - 1/x^2)^{13}$?

○ A: C(13,7) $12x^{14}$ ○ B: -C(13,6) $10x^{14}$

○ C: -C(13,5) x^{14} ○ D: C(13,8) $4x^{14}$

Trigonometry

TEST 1

1. **235° expressed in radians is?**

○ A: $\pi / 235$
○ B: $85\pi / 49$
○ C: $47\pi / 36$
○ D: $235/\pi$

2. **1/2 rotation anti-clockwise is called?**

○ A: Right angle
○ B: Straight Angle
○ C: Circle
○ D: None of the above.

3. If $5\sin\theta = 3$, $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to

○ A: ½
○ B: 1
○ C: 2
○ D: 4

4. **If $\cos 3\theta = \sqrt{3}/2$; $0 < \theta < 20^o$ then the value of θ is?**

○ A: 0°
○ B: 5°
○ C: 10°
○ D: 15°

5. **If $\sec\theta - \tan\theta = 1/2$ then $\sec\theta + \tan\theta = ?$**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. **cos A - cos B = ?**

○ A: $2\cos(A+B)/2 \cos(A-B)/2$
○ B: $2\cos(A+B)/2 \sin(A-B)/2$
○ C: $2\sin(A+B)/2 \cos(A-B)/2$
○ D: $-2\sin(A+B)/2 \sin(A-B)/2$

7. **Which of the following is not ture?**

○ A: $\cot(-\theta) = -\cot\theta$
○ B: $\cos(-\theta) = \cos\theta$
○ C: $\sin(-\theta) = -\sin\theta$
○ D: $\tan(-\theta) = \tan(\theta)$

8. **$\sin 30^0 + \cos 60^0 + \tan 45^0$ is equal to?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

9. **In sexagesimal system angle is represented in?**

○ A: Degrees
○ B: Degrees, Minutes and Seconds
○ C: Radians
○ D: Mircro radians.

10. **If $\sin\theta = \cos\theta$ then $\theta = ?$**

○ A: 30°
○ B: 45°
○ C: 60°
○ D: 75°

11. **If the length of arc is twice the radius of the circle. Then angle subtended at the center is?**

○ A: 1 radian
○ B: 2 radian
○ C: $\pi/3$ radian
○ D: $\pi/4$ radian

12. What is the period of tan 4x?

○ A: π
○ B: π/3
○ C: π/4
○ D: π/8

13. $\tan^2 x - \sin^2 x$ is equal to?

○ A: $\tan^2 x \operatorname{cosec}^2 x$
○ B: $\sin^2 x \cot^2 x$
○ C: $\sec^2 x \operatorname{cosec}^2 x$
○ D: $\tan^2 x \sin^2 x$

14. tan 225° =?

○ A: 0
○ B: 1
○ C: √3
○ D: 1/√3

15. tan (2π - θ) = ?

○ A: tan θ
○ B: - tan θ
○ C: cot θ
○ D: - cot θ

16. If cos A = 1/√2 and sin B = 1/2 then A+B = ?

○ A: 60°
○ B: 75°
○ C: 90°
○ D: 120°

17. 1° = ?

○ A: 0.0125 radian
○ B: 0.0175 radian
○ C: 0.0225 radian
○ D: 0.0275 radian

18. 35° 20' in radians is?

○ A: 28π / 220
○ B: 53π / 45
○ C: 53π / 290
○ D: 53π / 270

19. cos (π + θ) = ?

○ A: sin θ
○ B: - sin θ
○ C: cos θ
○ D: - cos θ

20. If A = B = 60°. Then $\frac{cscA + cotB}{secA * tanB}$ = ?

○ A: 0
○ B: 1
○ C: ½
○ D: 1/√2

TEST 2

1. Which of the following relations is possible?

○ A: sec θ = 2/3
○ B: sin θ = 4/3
○ C: tan θ = 2014
○ D: cos θ = $(1+t^2) / (1-t^2)$

2. sec (-960°) = ?

○ A: 2
○ B: √2
○ C: -√2
○ D: -2

3. cos 2α = ?

○ A: sin α cos α
○ B: 2 sin α cos α
○ C: $\cos^2 \alpha - \sin^2 \alpha$
○ D: $\cos^2 \alpha + \sin^2 \alpha$

4. If α, β and γ are the angles of a triangle then sin ($\alpha + \beta$) = ?

○ A: sin γ ○ B: cos γ

○ C: - sin γ ○ D: - cos γ

5. sin (-625°) = ?

○ A: sin 5° ○ B: cos 5°

○ C: sin 15° ○ D: cos 15°

6. Converting 21.256^o to DMS gives?

○ A: 21° 15.36' ○ B: 21° 18' 32"

○ C: 21° 15' 22" ○ D: 21° 15' 28"

7. If sin (A + B + C) = 1, tan (A - B) = $1/\sqrt{3}$, and sec(A + C) = 2, then?

○ A: A = 120°, B = 60° and C = 0° ○ B: A = 60°, B = 30° and C = 0°

○ C: A = 60°, B = 60° and C = 60° ○ D: A = 90°, B = 60° and C = 30°

8. sin A + sin B = ?

○ A: -2 sin (A+B)/2 sin (A-B)/2 ○ B: 2 cos (A+B)/2 cos (A-B)/2

○ C: 2 sin (A+B)/2 cos (A-B)/2 ○ D: 2 cos (A+B)/2 sin (A-B)/2

9. The value of tan 15° + cot 15° is ?

○ A: 1 ○ B: $\sqrt{3}$

○ C: $\sqrt{3}/2$ ○ D: 4

10. The period of the function f(x) =cos 4x is?

○ A: π ○ B: 2π

○ C: $\pi/2$ ○ D: $3\pi/2$

11. If $x = \sin^2 \theta \cos \theta$ and $y = \cos^2 \theta \sin \theta$ then $\sin \theta$ = ?

○ A: x^2 / y ○ B: y^2 / x

○ C: $(y^2 / x)^{1/3}$ ○ D: $(x^2 / y)^{1/3}$

12. What is the period of cot x/7 ?

○ A: 7π ○ B: $2\pi/7$

○ C: $\pi/7$ ○ D: $\pi/14$

13. If cot θ = sin 2θ, then θ is equal to?

○ A: 45° and 90° ○ B: 45° and 90°

○ C: 90° and 60° ○ D: 60° and 30°

14. The value of $\cos^2 15° - \cos^2 30° + \cos^2 45° - \cos^2 60° + \cos^2 75°$ is?

○ A: 1 ○ B: 1/2

○ C: 3/2 ○ D: 2

15. If tan θ = 8/15 then what is the value of sec θ for θ lying in the quadrant III?

○ A: 15/17 ○ B: -15/17

○ C: 17/15 ○ D: - 17/15

16. The largest value of sinθ x cosθ is?

○ A: 1 ○ B: 1/2

○ C: $1/\sqrt{2}$ ○ D: $1/\sqrt{3}$

17. $(1 + \sec\theta)(1 - \cos\theta) = ?$

○ A: $\sin\theta$

○ B: $\cot\theta$

○ C: $\cot\theta\cos\theta$

○ D: $\tan\theta\sin\theta$

18. $\sec(-7\pi/4) = ?$

○ A: $\sqrt{2}$

○ B: $-\sqrt{2}$

○ C: $2/\sqrt{3}$

○ D: $-2/\sqrt{3}$

19. If the length of a chord of a circle is equal to the radius of that circle, the angle subtended (in radians) at the centre of the circle by the chord is?

○ A: 1

○ B: $\pi/2$

○ C: $\pi/3$

○ D: $\pi/6$

20. The value of cos1° * cos2° * cos3° ...... cos179° is ?

○ A: 0

○ B: 1

○ C: 2

○ D: -1

TEST 3

1. The perimeter of a certain sector of a circle is equal to half that of the circle of which it is a part. The circular measure of the angle of the sector is?

○ A: π

○ B: $\pi - 2$

○ C: $2\pi/3$

○ D: $\pi - 4$

2. tan 3x - tan 2x - tan x is equal to?

○ A: tan x / (tan 2x * tan 3x)

○ B: $(\tan x)^3$

○ C: (tan 3x + tan 2x + tan x) - (tan x * tan 2x)

○ D: tan x * tan 2x * tan 3x

3. $\sin 75^o = ?$

○ A: $\dfrac{\sqrt{2}(\sqrt{3}+1)}{4}$

○ B: $\dfrac{\sqrt{2}(\sqrt{3}-1)}{4}$

○ C: $\sqrt{3}/4$

○ D: $-\sqrt{3}/4$

4. The equation sin x cos x = 2 has?

○ A: One solution

○ B: Two solutions

○ C: Infinite solutions.

○ D: No solution.

5. cos (x+y) sin (x-y) = ?

○ A: 1/2 (sin 2x - sin 2y)

○ B: 1/2 (sin 2y - sin 2x)

○ C: sin 2x - sin 2y

○ D: sin 2x + sin 2y

6. $\tan(294^o) = ?$

○ A: $\cot 32^o$

○ B: $-\cot 32^o$

○ C: $-\cot 24^o$

○ D: $\cot 24^o$

7. If sin A + sin B = x and cos A + cos B = y, cos(A - B) is equal to ?

○ A: $x^2 + y^2 - 2$

○ B: $(x^2 + y^2 - 2) / 2$

○ C: $(2 - x^2 + y^2) / 2$

○ D: $(2 - x^2 - y^2) / 2$

8. Period of cot (3x) - sin (4x) is?

○ A: πq
○ B: π/2
○ C: π/3
○ D: π/4

9. $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = ?$

○ A: 1
○ B: 2
○ C: tan 2θ
○ D: cot 2θ

10. (1 - cos α) / sin α = ?

○ A: cos α/2
○ B: sin α/2
○ C: sec α/2
○ D: tan α/2

11. 8 sin x/8 cos x/2 cos x/4 cos x/8 = ?

○ A: 4 sin x
○ B: sin x
○ C: cos x
○ D: 8 cos x

12. What is the domain of $\sqrt{\sin^{-1} 2x + \pi/6}$ **?**

○ A: [1/4 , 1/2]
○ B: [-1/4 , 1/2]
○ C: [1/8 , 1/2]
○ D: [-1/8 , 1/2]

13. cos 12° + cos 48° = ?

○ A: 2 cos 30° cos 18°
○ B: - 2 cos 30° cos 18°
○ C: 2 cos 30° sin 18°
○ D: - 2 cos 30° sin 18°

14. If (x $\sin^3 \alpha$ + y $\cos^3 \alpha$) = sin α cos α and (x sin α - y cos α = 0), then $x^2 + y^2$ = ?

○ A: 0
○ B: 2
○ C: -1
○ D: 1

15. If $\sin^2\theta$ + 3 cosθ - 2 = 0, $\cos^3\theta$ + $\sec^3\theta$ is equal to?

○ A: 18
○ B: 9
○ C: 6
○ D: 3

16. The value of tan 1° * tan 2° * tan 3° ...... tan 89° = ?

○ A: 0
○ B: 1
○ C: -1
○ D: 1/2

17. If cos (A - B) = 3/5 and tan A . tan B = 2 then ?

○ A: cos A cos B = 1/5
○ B: sin A sin B = -2/5
○ C: cos (A + B) = 1/5
○ D: sin A sin B =4/5

18. sin 2α / (1 + cos 2α) = ?

○ A: cot α
○ B: tan α
○ C: sec α
○ D: csc α

19. Find the value of $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$

○ A: tan 3θ
○ B: cot 3θ
○ C: tan 6θ
○ D: cot 6θ

20. $\dfrac{\tan\alpha + \tan\beta}{\tan\alpha - \tan\beta} = ?$

○ A: $\sin(\alpha + \beta) / \sin(\alpha - \beta)$
○ B: $\sin(\alpha - \beta) / \sin(\alpha + \beta)$
○ C: $\cot(\alpha + \beta)$
○ D: $\sin\alpha / \sin(\alpha - \beta)$

TEST 4

1. tan (15°) = ?

○ A: $(\sqrt{3} + 1) / (\sqrt{3} - 1)$
○ B: $(\sqrt{3} - 1) / (\sqrt{3} + 1)$
○ C: $\sqrt{3} / (\sqrt{3} + 1)$
○ D: $1/3\sqrt{3}$

2. The bottom of a pendulum describes an arc 3 ft long when the pendulum swings through an angle of 1/5 radian. The length of the pendulum in feet is ?

○ A: 15 ft
○ B: 12 ft
○ C: 5/3 ft
○ D: 3/5 ft

3. tan ($\pi/4 + \theta$) tan ($3\pi/4 + \theta$) is equal to ?

○ A: 0
○ B: 1
○ C: -1
○ D: 2

4. If tan 2 A = cot (A - 18°), then the value of A is?

○ A: 18°
○ B: 24°
○ C: 27°
○ D: 36°

5. What is the period of sec 9x ?

○ A: π
○ B: $2\pi/9$
○ C: $\pi/9$
○ D: $\pi/18$

6. If cot $\theta > 0$ and sin $\theta < 0$ then θ lies in the ?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

7. If α, β and γ are the angles of a triangle then tan ($\alpha + \beta$) - tan γ = ?

○ A: 2 tan γ
○ B: - 2 tan γ
○ C: 0
○ D: 1

8. 1 radian = ?

○ A: 60°
○ B: 59°
○ C: 58°
○ D: 57°

9. 6'' in radians = ?

○ A: π / 216000 radians
○ B: π / 108000 radians
○ C: π / 648000 radians
○ D: π / 3600 radians

10. The radius of a circle is 8 in. Find the angle in radians that an arc of 1 ft subtends in the center of this circle?

○ A: 1/8
○ B: 2/8
○ C: 3/2
○ D: $\pi/6$

11. In a triangle ABC, $A = 45°$, then the value of $(1 + \cot B)(1 + \cot C)$ is equal to ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

12. If $\tan\theta = -4/3$, $\sin\theta = ?$

○ A: -4/5 but not 4/5 ○ B: 4/5 but not -4/5

○ C: 4/5 or - 4/5 ○ D: Undefined.

13. Which of the following is true for $0^o \leq \theta < 90^o$?

○ A: $1/\sec\theta > 1$ ○ B: $1/\mathrm{cosec}\,\theta < 1$

○ C: $\sec\theta = 0$ ○ D: $1/\cos\theta < 1$

14. Which of the following is true about θ in the quadrant II?

$\csc\theta$ is positive, $\cos\theta$ is positive, $\tan\theta$ is positive

○ A: i only ○ B: i and ii only

○ C: ii and iii only ○ D: None of them is true

15. Domain of $\csc\theta$ is $\theta \in R$ except $\theta = ?$

○ A: $n\pi$ where $n \in Z$ ○ B: $[(2n+1)/2]\,\pi$ where $n \in Z$

○ C: $n\pi/2$ where $n \in Z$ ○ D: $(2n+1/2)\pi$ where $n \in Z$

16. If $\sec\theta + \tan\theta = x$ then $\tan\theta = ?$

○ A: $(x^2 - 1) / x$ ○ B: $(x^2 + 1) / x$

○ C: $(x^2 + 1) / 2x$ ○ D: $(x^2 - 1) / 2x$

17. Which of the following is not possible?

○ A: $\sin\theta = 3/4$ ○ B: $\tan\theta = 75$

○ C: $\mathrm{cosec}\,\theta = 5/3$ ○ D: $\cos\theta = (1 + t^2) / (1 - t^2)$

18. The value of $\sin^2 \pi/8 + \sin^2 3\pi/8 + \sin^2 5\pi/8 + \sin^2 7\pi/8$ is?

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

19. If $\tan A = 1/2$, then $\tan 2A$ is equal to?

○ A: 1 ○ B: 1/2

○ C: 4/3 ○ D: 5/4

20. If $A = B = C = 60^o$ then $\dfrac{tanA + tanB + tanC}{tanA * tanB * tanC} = ?$

○ A: 0 ○ B: 1

○ C: -1 ○ D: $\sqrt{3}$

Inverse Trigonometric Function

TEST 1

1. **Which of the following is true?**

$\sin^{-1} x = (\sin x)^{-1,}$ $\cos^{-1} x = (\cos x)^{-1,}$ $\tan^{-1} x = (\cot x)^{-1}$

○ A: i and ii only
○ B: ii only
○ C: i, ii and iii
○ D: None of them is true.

2. **$\cos^{-1} A + \cos^{-1} B = ?$**

○ A: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ D: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$

3. **Principal value of $\sin^{-1} (-\sqrt{3}/2) = ?$**

○ A: $-2\pi/3$
○ B: $-\pi/3$
○ C: $\pi/3$
○ D: $2\pi/3$

4. **Range of $y = \sin^{-1} x$ is?**

○ A: $-\pi/2 \le y \le \pi/2$
○ B: $-\pi \le y \le \pi$
○ C: $-\pi/4 \le y \le \pi/4$
○ D: $-1 \le y \le 1$

The value of $\tan^{-1} (-1/\sqrt{3})$ is?

○ A: $\pi/3$
○ B: $-\pi/4$
○ C: $3\pi/4$
○ D: $-\pi/6$

5. **What is the value of $\tan^{-1} 3/4 + \tan^{-1} 5/12$?**

○ A: $\tan^{-1} 56/33$
○ B: $\tan^{-1} 16/33$
○ C: $\tan^{-1} 15/48$
○ D: $\tan^{-1} 16/63$

6. **$y = \tan x$ is called principal tangent function if ?**

○ A: - infinity < x < infinity
○ B: $-\pi < x < \pi$
○ C: $-\pi/2 < x < \pi/2$
○ D: $0 < x < \pi$

7. **$\cos^{-1} (-1/2) = ?$**

○ A: $\pi/3$
○ B: $-2\pi/3$
○ C: $2\pi/3$
○ D: Both B and C.

8. **Range of $y = \cos^{-1} x$ is?**

○ A: $-\pi/2 \le y \le \pi/2$
○ B: $-\pi \le y \le \pi$
○ C: $0 \le y \le \pi/2$
○ D: $0 \le y \le \pi$

9. **$2 \tan^{-1} A = ?$**

○ A: $\tan^{-1} 2A / (1 + A^2)$
○ B: $\tan^{-1} 2A / (1 - A^2)$
○ C: $\tan^{-1} A / (1 + A^2)$
○ D: $\tan^{-1} A / (1 - A^2)$

10. **$\cos (\cos^{-1} 1/5) = ?$**

○ A: 1
○ B: 5
○ C: 1/5
○ D: 4/5

11. $\cos(\sin^{-1} 1/\sqrt{2}) = ?$

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{2}/3$
○ C: $2/\sqrt{3}$ ○ D: $1/2$

12. $\cos^{-1} A - \cos^{-1} B = ?$

○ A: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$
○ D: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

13. Which of the following function has domain ranging from - infinity to + infinity ?

○ A: $y = \sin^{-1} x$ ○ B: $y = \sec^{-1} x$
○ C: $y = \cos^{-1} x$ ○ D: $y = \tan^{-1} x$

TEST 2

1. The value of sec $\left[\tan^{-1}\left(\frac{b+a}{b-a}\right) - \tan^{-1}\left(\frac{a}{b}\right)\right]$ is

○ A: $\sqrt{3}/2$ ○ B: $\sqrt{2}$
○ C: 1 ○ D: $1/\sqrt{3}$

2. If $y = \sin^{-1} x$ then $\cos(\sin^{-1} x) = ?$

○ A: $(1-x)^{1/2}$ ○ B: $(1-x)^{1/2}$
○ C: $(1-x^2)^{1/2}$ ○ D: $(1+x^2)^{1/2}$

3. $\cos[\tan^{-1} 1/3 + \tan^{-1} 1/2] = ?$

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{2}$
○ C: $\sqrt{3}/2$ ○ D: $1/2$

4. $\cot^{-1}(-1) = ?$

○ A: 1 ○ B: $\pi/2$
○ C: $2\pi/3$ ○ D: $3\pi/4$

5. Principal value of $\sin^{-1}(\sin 3\pi/5) = ?$

○ A: $3\pi/5$ ○ B: $4\pi/5$
○ C: $2\pi/5$ ○ D: $\pi/5$

6. What is the principal value of $\cot^{-1}(-1/\sqrt{3})$?

○ A: $3\pi/2$ ○ B: $\pi/3$
○ C: $\pi/6$ ○ D: $2\pi/3$

7. $\sin^{-1} 3/5 + \sin^{-1} 8/17 = ?$

○ A: $\sin^{-1}(11/23)$ ○ B: $\sin^{-1}(19/76)$
○ C: $\sin^{-1}(63/95)$ ○ D: $\sin^{-1}(77/85)$

8. Which of the following is Domain and Range of $y = \cot^{-1} x$?

○ A: Domain: $-\infty < x < \infty$ Range: $-\pi/2 < y < \pi/2$
○ B: Domain: $-1 < x < 1$ Range: $-\pi/2 < y < \pi/2$
○ C: Domain: $-\infty < x < \infty$ Range: $-\pi < y < \pi$
○ D: Domain: $-\infty < x < \infty$ Range: $0 < y < \pi$

9. Principal value of $\sin^{-1}$ [sin (2π/3)] = ?

○ A: 2π/3 ○ B: -2π/3

○ C: π/3 ○ D: π/6

10. cos ($\sin^{-1}$ 3/5) = ?

○ A: 3/5 ○ B: 1/3

○ C: 4/5 ○ D: 2/√3

11. Range of y = $\tan^{-1}$ x is ?

○ A: $-\pi/2 < y < \pi/2$ ○ B: $-\pi/2 \le y \le \pi/2$

○ C: $0 \le y \le 2\pi$ ○ D: $0 < y < 2\pi$

12. $tan^{-1}\ \dfrac{a-b}{1+ab} + tan^{-1}\ \dfrac{b-c}{1+bc}\ =?$

○ A: $\tan^{-1}$ a - $\tan^{-1}$ c ○ B: $\tan^{-1}$ a - $\tan^{-1}$ b

○ C: $\tan^{-1}$ b - $\tan^{-1}$ c ○ D: $\tan^{-1}$ c - $\tan^{-1}$ a

13. If α = 2$\cos^{-1}$ 4/5 then sin α = ?

○ A: 3/5 ○ B: 24/25

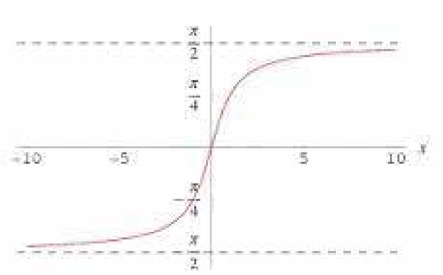
○ C: 4/5 ○ D: 30/25

14. $sin^{-1}(2x\sqrt{1-x^2})\ =?$

○ A: $\sin^{-1}$ x ○ B: 2 $\sin^{-1}$ x

○ C: 3 $\sin^{-1}$ x ○ D: 4 $\sin^{-1}$ x

15. The graph below is for which function?



○ A: y = $\sin^{-1}$ x ○ B: y = $\cos^{-1}$ x

○ C: y = $\tan^{-1}$ x ○ D: y = $\cot^{-1}$ x

16. If $\tan^{-1}$ (1 + x) + $\tan^{1}$ (1 − x) = π/2 then x = ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: √3

17. y = sec x is called a principal secant function if?

○ A: $-\pi \le x \le \pi$ and $x \neq \pi/2$ or $-\pi/2$ ○ B: $-\pi/2 < x < \pi/2$

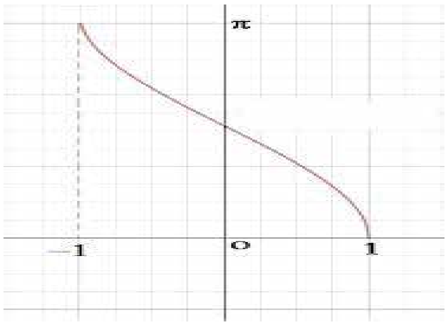
○ C: $0 \le x \le \pi$ and $x \neq \pi/2$ ○ D: $0 \le x < \pi/2$

18. If α = $\sin^{-1}$ 5/13 , then cos α = ?

○ A: 8/13 ○ B: 7/13

○ C: 11/13 ○ D: 12/13

19. The graph below is for which function?



○ A: $\sin^{-1} x$

○ B: $\cos^{-1} x$

○ C: $\tan^{-1} x$

○ D: $\cot^{-1} x$

20. $\operatorname{cosec}^{-1} (-2/\sqrt{3}) = ?$

○ A: $\pi/3$

○ B: $-\pi/3$

○ C: $4\pi/3$

○ D: $-4\pi/3$

TEST 3

1. $\sin (\sin^{-1} 1/5 + \cos^{-1} x) = 1$ then $x = ?$

○ A: 2/5

○ B: 1/3

○ C: 1/5

○ D: 1/2

2. $\sin (2\cos^{-1} x) = ?$

○ A: $2x\sqrt{1-x^2}$

○ B: $2x\sqrt{1-x}$

○ C: $\dfrac{2x}{\sqrt{1-x^2}}$

○ D: $\dfrac{2x}{\sqrt{1+x^2}}$

3. Domain and range of $y = \csc^{-1} x$ is ?

○ A: Domain : $-\infty < x < \infty$ Range : $-\pi/2 \leq y \leq \pi/2$

○ B: Domain : $-1 \leq x \leq 1$ Range : $-\pi/2 \leq y \leq \pi/2$ and $y \neq 0$

○ C: Domain : $1 \leq |x|$ Range : $-\pi/2 \leq y \leq \pi/2$ and $y \neq 0$

○ D: Domain : $1 > |x|$ Range : $-\pi/2 \leq y \leq \pi/2$ and $y \neq 0$

4. $\sin (\cos^{-1} -2/3) = ?$

○ A: $1/\sqrt{2}$

○ B: $\sqrt{5}/3$

○ C: $1/\sqrt{3}$

○ D: $\sqrt{3}$

5. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, what is the value of x?

○ A: 1/6

○ B: -1

○ C: -1 and 1/6

○ D: 1

6. $\cos^{-1} (\cos 7\pi/6) = ?$

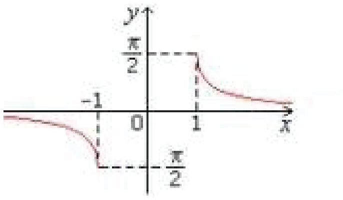
○ A: $7\pi/6$

○ B: $\pi/6$

○ C: $5\pi/6$

○ D: $\pi/3$

7. The graph below is for which function?



○ A: $y = \tan^{-1} x$ ○ B: $y = \cot^{-1} x$

○ C: $y = \sec^{-1} x$ ○ D: $y = \csc^{-1} x$

8. If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$, then $\cos^{-1} x + \cos^{-1} y$ is equal to ?

○ A: $2\pi/3$ ○ B: $3\pi/2$

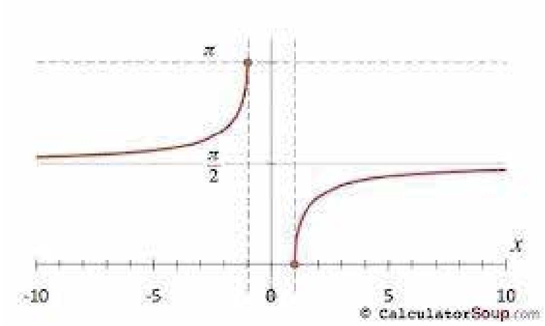
○ C: $\pi/5$ ○ D: $\pi/3$

9. $\tan^{-1} (-x) = ?$

○ A: $\tan^{-1} (x)$ ○ B: $- \tan^{-1} (x)$

○ C: $- \cot^{-1} (x)$ ○ D: $\cot^{-1} (x)$

10. The graph below is for which function?



○ A: $y = \tan^{-1} x$ ○ B: $y = \cot^{-1} x$

○ C: $y = \csc^{-1} x$ ○ D: $y = \sec^{-1} x$

11. $\tan (\sin^{-1} x) = ?$

○ A: $x / (1-x^2)$ ○ B: $x / (1-x)$

○ C: $\dfrac{x}{\sqrt{1+x^2}}$ ○ D: $\dfrac{x}{\sqrt{1-x^2}}$

12. $\sin\left[\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right] =$

○ A: $\sqrt{3}/2$ ○ B: $-\sqrt{3}/2$

○ C: ½ ○ D: - 1/2

13. The value of $\tan (\cos^{-1}(4/5) + \tan^{-1} (2/3))$ is equal to ?

○ A: 7/5 ○ B: 17/6

○ C: 17/18 ○ D: Cannot be determined.

14. The value of $\tan^{-1}1 + \tan^{-1} 2 + \tan^{-1} 3$ is ?

○ A: $\pi/2$ ○ B: -1

○ C: 1 ○ D: 0

15. tan ($\sin^{-1}$ -3/4) = ?

○ A: 3/√5 ○ B: -3/√5

○ C: 3/√7 ○ D: -3/√7

16. Value of cos ($\tan^{-1}$ 15/8 - $\sin^{-1}$ 7/25) = ?

○ A: 114/350 ○ B: 297/425

○ C: 215/345 ○ D: 138/147

17. The product of the roots of the equation $\tan^{-1}$ (2x) + $\tan^{-1}$ (3x) = 3π/4 is ?

○ A: -1/6 ○ B: -1/2

○ C: 1 ○ D: 3

Function And Limits

TEST 1

1. **If f(x,y,z)=2x+3y-z and f(a,b,0)=f(0,a,b), then b / a equals**

○ A: 0 ○ B: 2

○ C: ½ ○ D: 1/4

2. **Range of the function $f(x) = \sqrt{36 - x^2}$ is**

○ A: $[0, -\infty]$ ○ B: $[\infty, -\infty]$

○ C: $[0, 6]$ ○ D: $[36, 1]$

3. **If f(x) = $3x^2$ - 2x + 4, f(-2) =**

○ A: -2 ○ B: 20

○ C: 4 ○ D: 12

4. **If g(x) = x^3 - x^2 - x - 1, then the value of g(-1) is:**

○ A: 0 ○ B: 1

○ C: -2 ○ D: 2

5. **Let f(x) = $3x^2$ + 4, g(x) = 2 and h={(1,2),(2,1),(3,2)}.**

○ A: f(x) is the only function. ○ B: f(x) and g(x) are the only functions.

○ C: f(x), g(x) and h(x) are all functions.

○ D: None of these are functions.

6. **If f(x)=3 and g(x)=2, then f(g(x))=**

○ A: 2 ○ B: 3

○ C: 6 ○ D: 5

7. **Range of the function $f(x) = 2x - 3$ is**

○ A: $(-\infty, +\infty)$ ○ B: [2,3]

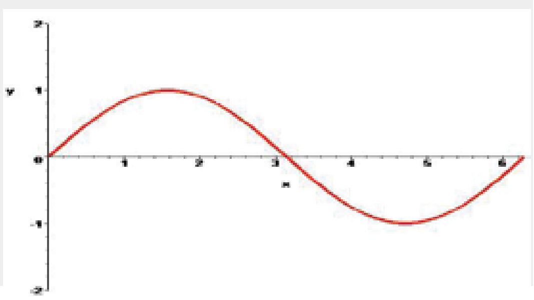
○ C: [2,10] ○ D: None of the above.

8. If f(x)=2x+3 and g(x) = x^2 - 1, then f(g(2))=

○ A: 4 ○ B: 9

○ C: 13 ○ D: 19

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If p(x)=4x-6 and p(a)=0, then a=

○ A: 3 ○ B: 2

○ C: 3/2 ○ D: 2/3

11. If f(x)=x and g(x)=x.f(x), then f(x) / g(x) =

○ A: x ○ B: 1/x

○ C: 1 ○ D: None of the above.

12. If $f(x) = x^7 - 97x^6 - 199x^5 + 99x^4 + 2x + 195$, $f(-1)$ equals:

○ A: 24 ○ B: 154

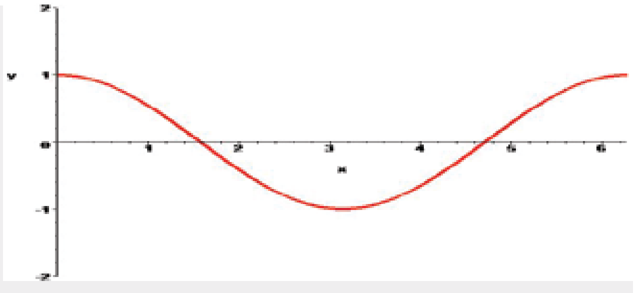
○ C: 272 ○ D: 393

13. What value(s) must be excluded for the domain of f={(x,y):y=$\frac{x+2}{x-2}$}?

○ A: 2 ○ B: -2

○ C: 0 ○ D: 2 and -2

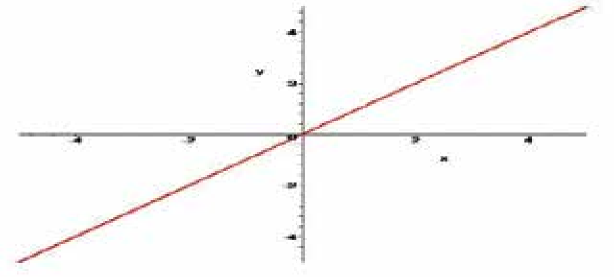
14. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

15. The following figure shows a graph of which type of function?



○ A: Linear Function
○ B: Even Degree Polynomial
○ C: Odd Degree Polynomial
○ D: None of the Above

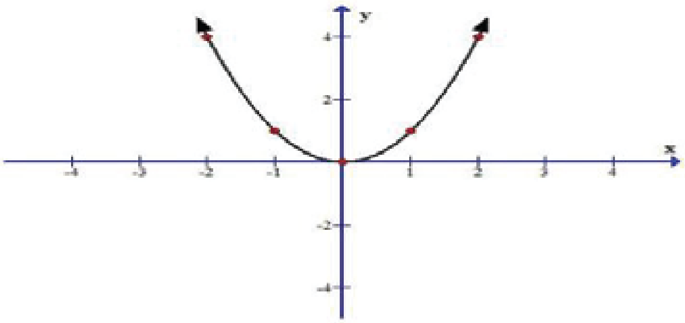
16. If f(1) = 1 and f(2) = 2 and f(-1) = -1, then f(x) would be:

○ A: 0
○ B: 1
○ C: 2
○ D: x

17. If $f(r,\theta) = r\cos\theta,\ f(2,\frac{\pi}{3}) =$

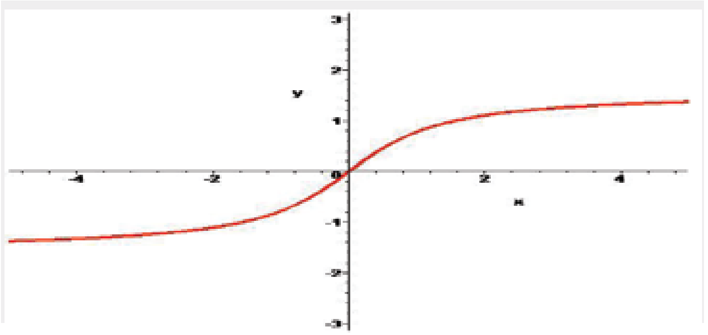
○ A: 2π
○ B: 1
○ C: $\frac{\pi}{6}$
○ D: $\frac{1}{2}$

18. Which of the following functions represents the plot shown?



○ A: $f(x) = x^2$
○ B: $f(x) = x^2 - x - 5$
○ C: $f(x) = x^3$
○ D: None of the above.

19. The following figure shows a graph of which type of function?



○ A: Cosecant
○ B: Secant
○ C: Cotangent
○ D: Arctangent

20. If $f(x, y, z) = x^2 + y^2 - 2z$ **for all real numbers x, y and z, then f(-1,-1,-1)=**

○ A: 0
○ B: 2
○ C: 4
○ D: 6

TEST 2

1. **If f(x,y)=3x+2y-8 and g(z) = z^2 for all real numbers x,y,z then f(3,g(4))=**

   ○ A: 15 ○ B: 33

   ○ C: 45 ○ D: 25

2. **For a function to be even as well as odd, it must be:**

   ○ A: Symmetric about origin (by 180^0) ○ B: Symmetric about y-axis (by 180^0)

   ○ C: Both A and B ○ D: None of the above

3. **If g(x)=3 and $f(x) = \dfrac{1}{3x+2}$, then f(g(3))=**

   ○ A: 1/11 ○ B: 1/17

   ○ C: 3/5 ○ D: 9/11

4. **Which statement is correct for the following functions?**

   $f(x) = \frac{2}{7}x^2,$ $g(x) = -x^3$

   ○ A: Both I and II are even. ○ B: Both I and II are odd.

   ○ C: I is even and II is odd. ○ D: I is odd and II is even.

5. **If f(x) = x+3 and g(x) = x^2 , for what value of does f(g(x))=g(f(x))**

   ○ A: 1 ○ B: 0

   ○ C: -1 ○ D: 2

6. **Which of the following relations are said to be odd?**

   y=x^2 + 1, y=sin (x), y = x^3 -x + 1

   ○ A: Only II. ○ B: Only I & II.

   ○ C: Only I & III. ○ D: Only II & III.

7. ***Find the inverse of*** $g(x) = \dfrac{2x}{x-1}$

   ○ A: $g^{-1}(y) = \dfrac{y+5}{y-2}$ ○ B: $g^{-1}(y) = \dfrac{y}{y-2}$

   ○ C: $g^{-1}(y) = \dfrac{y-7}{y}$ ○ D: $g^{-1}(y) = \dfrac{y+4}{y-2}$

8. **If f(x) = x^2 + 3x - 4 and g(x)=x-4, then f(g(x))=**

   ○ A: $2x^2$ - 3x + 2 ○ B: $2x^2$ - 3x

   ○ C: x^2 - 5x + 10 ○ D: x^2 - 5x

9. **Find** $\lim\limits_{x\to 1} \dfrac{\sqrt{x}-1}{x-1}$

   ○ A: ¼ ○ B: 1/2

   ○ C: 1 ○ D: 2

10. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is correct:

○ A: If $f(x) \geq 0$, then $\lim_{x\to a} f(x) \geq 0$

○ B: If $f(x) \geq g(x)$, then $\lim_{x\to a} f(x) \geq \lim_{x\to a} g(x)$

○ C: If $f(x) \geq 0$, then $\lim_{x\to a} \sqrt{f(x)} = \sqrt{\lim_{x\to a} f(x)}$

○ D: All are correct.

11. If {(3,2),(4,2),(3,1),(7,1),(2,3)} is to be a function, which of the following must be removed from the set?

○ A: (3,2) ○ B: (4,2)

○ C: (2,3) ○ D: None of the above.

12. To show a function is discontinuous, we can do one of three things:

Show that the function fails the sequence definition, Show that the function fails the ε -> δ definition

Prove by contradiction by relating it to a function known to be discontinuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

○ C: None of these are correct. ○ D: (i), (ii) and (iii) are correct.

13. If f(x,y)=x+y and g(x,y)=x-y, then f(g(2,1),f(2,-1)) equals:

○ A: 0 ○ B: 1

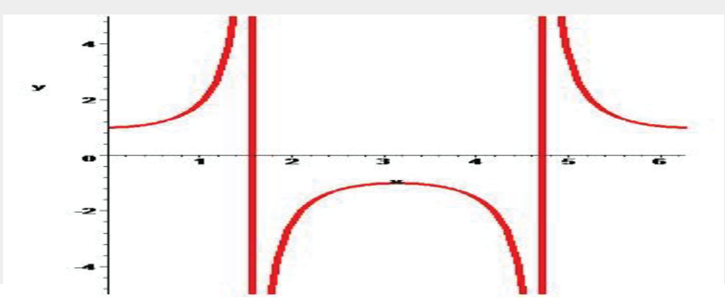
○ C: 2 ○ D: 4

14. Range of the function f(x)= sin (x) is

○ A: [-1,1] ○ B: $[-\frac{\pi}{2}, \frac{\pi}{2}]$

○ C: [0,1] ○ D: None of the above.

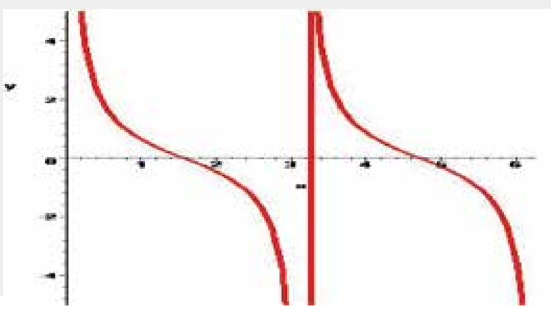
15. The following figure shows a graph of which type of function?



○ A: Tangent ○ B: Secant

○ C: Cosecant ○ D: Cosine

16. The following figure shows a graph of which type of function?



○ A: Cotangent ○ B: Arctangent

○ C: Cosecant ○ D: Tangent

17. $f(x)=\cos x$, $g(x)=\sin x$, $h(x) = \pm\sqrt{x}$

○ A: f(x) is the only function.

○ B: g(x) is the only function.

○ C: f(x) and g(x) are the only function.

○ D: All three are functions.

18. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is not true:

○ A: $\lim_{x\to a}(f(x) \pm g(x)) = \lim_{x\to a} f(x) \pm \lim_{x\to a} g(x)$

○ B: $\lim_{x\to a}(f(x)g(x)) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$

○ C: $\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$

○ D: $\lim_{x\to a} |f(x)| = -\left|\lim_{x\to a} f(x)\right|$

19. If $f(x,y) = 2x^2 - y^2$ and $g(x) = 2^x$, which of the following equal 2^{2x} ?

○ A: f(x,g(x))

○ B: f(g(x),x)

○ C: f(g(x),g(x))

○ D: f(g(x),0)

20. If $f(x) = 4x + 2$ for all x, then for x=0.5 $f^{-1}(x) =$?

○ A: 4

○ B: $\frac{1}{16}$

○ C: $\frac{1}{4}$

○ D: $-\frac{3}{8}$

TEST 3

1. If $g(x-1)= x^2 + 2$, then g(x)=

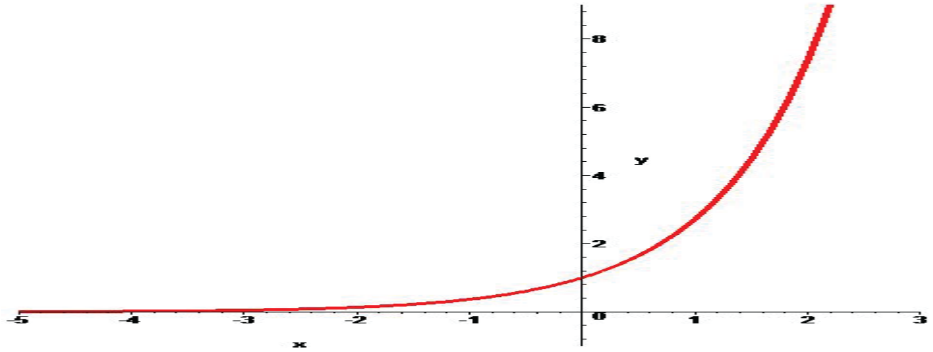
○ A: $x^2 - 2x + 3$

○ B: $x^2 + 2x + 3$

○ C: $x^2 - 2x + 6$

○ D: $x^2 - 2x$

2. The following figure shows graph of which type of function?



○ A: Log Function

○ B: Exponential Growth

○ C: Exponential Decay

○ D: None of the above.

3. If $f(x) = 3x - 5$ and $g(y) = y^2 - 1$, then f(g(z)) equals

○ A: $(3z-5)^2 - 1$ ○ B: $3z^2 - 8$

○ C: $3z^3 - 5z^2 - 3z + 8$ ○ D: $x^2 + 3z - 8$

4. $\lim_{x \to 0} \frac{\cos(2x) - 1}{\cos x - 1}$ **= ?**

○ A: 2 ○ B: 4

○ C: 8 ○ D: 10

5. $\lim_{h \to 0} \frac{\cos h - 1}{h} =$

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

6. $\lim_{x \to 0} \frac{x^4 + 5x - 3}{2 - \sqrt{x^2 + 4}}$ **= ?**

○ A: 6 ○ B: 15

○ C: ∞ ○ D: None of the above.

7. If f(x) = x^2 - 4, for what real number values of x will f(f(x))=0?

○ A: $\sqrt{6}$ ○ B: $\pm\sqrt{6}$

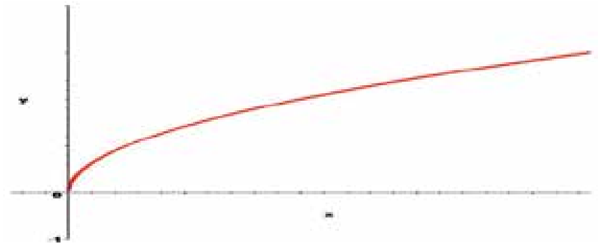
○ C: $\pm\sqrt{2}or\pm\sqrt{6}$ ○ D: No values

A straight line function, whose graph bisects the second and the fourth quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: a ○ B: -a

○ C: -2a ○ D: 0

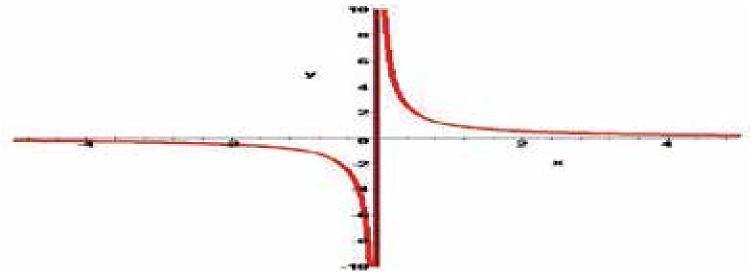
8. The following figure may show a graph of which function?



○ A: $y = \sqrt{x}$ ○ B: $y = \sqrt[6]{x}$

○ C: $y = \sqrt[5]{x}$ ○ D: Both A and B.

9. The figure shown below depicts a graph of which of the following functions?



○ A: $y=x+5$ ○ B: $y = x^2 / (x+2)$

○ C: $y = x^3 - 4$ ○ D: $y = 1 / x^3$

10. If $f(x) = 2^x$, then $f(\log_2 5)$=

○ A: 2^5 ○ B: 2^2

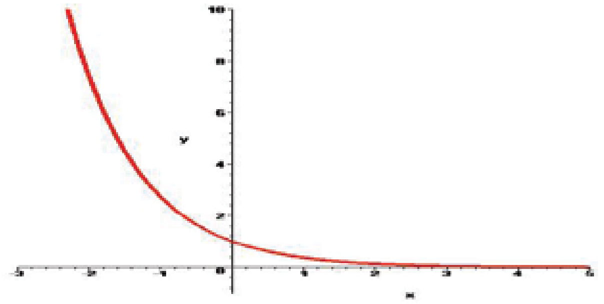
○ C: 2 ○ D: 5

11. If f is a linear function and f(1)=-2,f(-2)=1 and f(x)=1.5, what is x?

○ A: 0.5 ○ B: -0.5

○ C: -1.5 ○ D: -2.5

The wing figure shows a graph of which type of function?



○ A: Log function ○ B: Exponential Growth

○ C: Exponential Decay ○ D: None of the above.

12. If $f(x) = 3 - 2x + x^2$, then $\dfrac{f(x+t) - f(x)}{t}$ equals

○ A: t-x+4 ○ B: t+2

○ C: t+2x-2 ○ D: 2x-2

13. To show a function is continuous, we can do one of three things:

Show it satisfies the sequence definition of continuity, Show it satisfies the ε -> δ definition of continuity

Decompose it into simpler functions we already know to be continuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

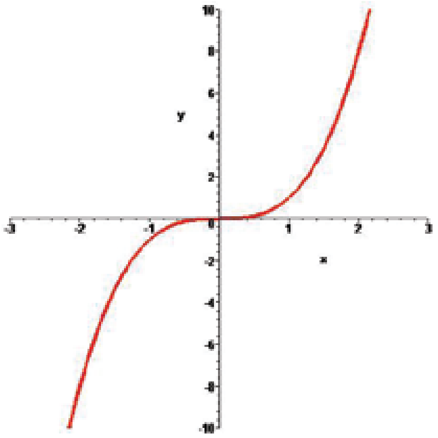
○ C: (i), (ii) and (iii) are correct. ○ D: None of these are correct.

14. **If** $f(x) = \left\{\begin{array}{lll} \frac{5}{x-2} & when & x \neq 2 \\ k & when & x = 2 \end{array}\right\}$**, what must the value 'k' equal in order that f(x) be a continuous** function?

○ A: 2 ○ B: 5

○ C: 0 ○ D: No value of k will make f(x) a continuous function.

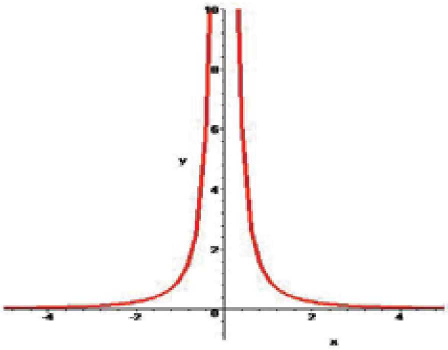
15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the above.

16. The figure shown below depicts a graph of which of the following functions?



○ A: $y = x^2 + 2x + 3$ ○ B: $y = 1 / x^2$

○ C: $y = 1 / x^3$ ○ D: None of the above.

17. If $f(x) = \dfrac{3x-1}{2}$ **and f(g(x))=x, then g(x)=**

○ A: $\dfrac{2x-1}{3}$ ○ B: $\dfrac{2x+1}{3}$

○ C: $\dfrac{2x}{3}+1$ ○ D: $\dfrac{2x}{3}-2$

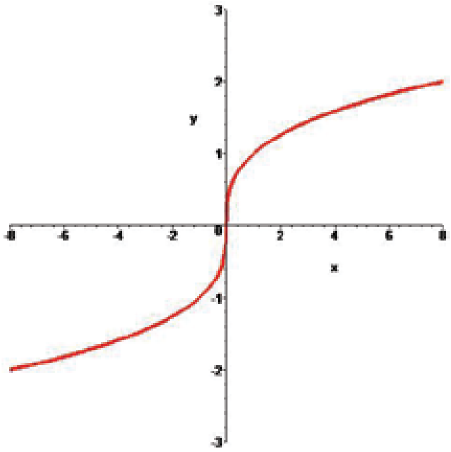
18. A straight line function, whose graph bisects the first and the third quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: 0 ○ B: 1

○ C: a ○ D: 2a

TEST 4

1. **The figure shown may depict a graph of which of the following functions?**



○ A: $y = \sqrt[3]{x}$ ○ B: $y = \sqrt[4]{x}$

○ C: Both A and B. ○ D: None of the above.

2. **Find** $\lim_{x\to\infty} \frac{x^2+5x+1}{2x^2-10}$

○ A: 1/6 ○ B: 1/4

○ C: ½ ○ D: 1

3. **Domain of the function f(x) = $5x^3 + 4x^2 + 2x - 5$ is:**

○ A: (-∞ , +∞) ○ B: (-4,4)

○ C: (-5,5) ○ D: None of the above.

4. **f={(x,y):y=4}, g={(x,y):$x^2 - y^2$=1}, and h={(x,y):x=3}, which of the these is a function?**

○ A: f only ○ B: g only

○ C: h only ○ D: f and h only

5. **If f(x) = $x^2 + 1$ and f(g(x))=4x-3, then g(x)=**

○ A: $2\sqrt{x} - 1$ ○ B: $2\sqrt{x-1}$

○ C: $\sqrt{x-1}$ ○ D: x-4

6. **If g(x)=3x+2 and g(f(x))=x, then f(2)=**

○ A: 2 ○ B: 6

○ C: 0 ○ D: 8

7. **If f(x,y)=2x-y and g(z)=sin z, then** $g(f(\pi, \frac{\pi}{2}))$ **equals:**

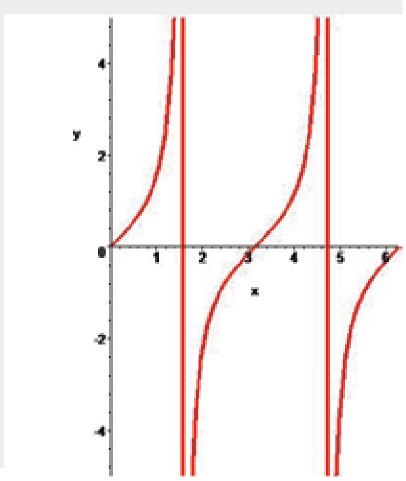
○ A: 0 ○ B: -1

○ C: 1 ○ D: 2

8. **Which of the following is the inverse of the function $f(x) = \sqrt{x} - 1$, for all x>0?**

○ A: $(x+1)^2$
○ B: $x^2 + 2$
○ C: x+1
○ D: x-2

9. **The following figure shows a graph of which type of function?**



○ A: Sine
○ B: Cosine
○ C: Tangent
○ D: Log

10. **If $f(x) = x - \frac{1}{x}$, then $f(a) - f(\frac{1}{a})$ equals:**

○ A: 0
○ B: 2a - 2/a
○ C: a - 1/a
○ D: 1

11. **If f(x)=2x-3, the inverse of f(x) could be represented by:**

○ A: $f^{-1}(x) = 3x - 2$
○ B: $f^{-1}(x) = \frac{1}{2x-3}$
○ C: $f^{-1}(x) = \frac{x+2}{3}$
○ D: $f^{-1}(x) = \frac{x+3}{2}$

12. **What value(s) must be excluded for the domain of $\frac{f}{g}(x)$ if $f(x) = 3x^2 - 4x + 1$ and $g(x) = 3x^2 - 3$?**

○ A: 0
○ B: 3
○ C: 1
○ D: both ±1

13. $\lim\limits_{x=3} = \frac{5x^2 - 8x - 13}{x^2 - 5}$ **= ?**

○ A: 0
○ B: 5
○ C: -2
○ D: 2

14. **If f(g(x)) = x^2 - 10 and g(x)=x+3 , then f(x)=**

○ A: $x^2 + 6x + 8$
○ B: $x^2 - 6x - 1$
○ C: $x^2 - 6x$
○ D: $x^2 + 8$

15. If f(x)=x, the inverse of f, f^{-1}, could be represented by:

○ A: $f^{-1}(x) = x$ ○ B: $f^{-1}(x) = 1$

○ C: $f^{-1}(x) = y$ ○ D: $f^{-1}(x) = \frac{1}{x}$

16. If $f(x) = x^3 - 4$, then the inverse of f=

○ A: $-x^3 + 4$ ○ B: $\sqrt[3]{x+4}$

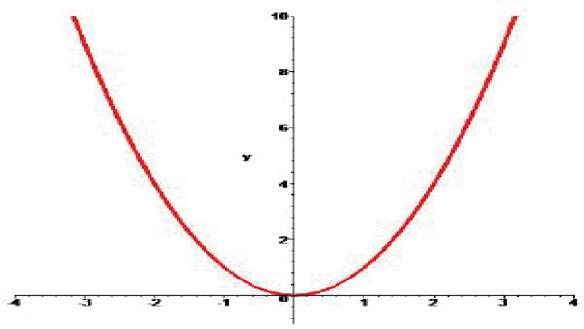
○ C: $\sqrt{x-4}$ ○ D: $\frac{1}{x-4}$

17. Find $\lim_{x \to 4} \frac{x^2 - 6x + 8}{x - 4}$.

○ A: -2 ○ B: 0

○ C: 2 ○ D: 4

18. The following figure shows graph of which type of function?



○ A: Linear function ○ B: Even degree polynomial

○ C: Inverse of even degree polynomial ○ D: Inverse of odd degree polynomial

19. Find $\lim_{x \to \infty} \frac{3x^2 + 1}{4x^3 + 2x + 1}$

○ A: 0 ○ B: 4

○ C: 10 ○ D: 15

20. If $f(x) = ax^2 + bx + c$ and f(1) = 3 and f(-1) = 3, then a+c equals

○ A: -3 ○ B: 0

○ C: 3 ○ D: 6

Differentiation

TEST 1

1. $\lim\limits_{x \to 0} \frac{1 - cos\, x}{x} \quad = ?$

○ A: 1 ○ B: 0
○ C: -1 ○ D: Infinity

2. d/dx f(x).g(x) = ?

○ A: f(x).g(x) ○ B: f'(x).g(x) + f(x).g'(x)
○ C: f'(x).g(x) - f(x).g'(x) ○ D: f'(x).g'(x) + f(x).g(x)

3. d/dx Sin^{-1} x = ?

○ A: $1/(1-x^2)^{1/2}$ ○ B: $- 1/(1-x^2)^{1/2}$
○ C: $1/(1+x^2)^{1/2}$ ○ D: $-1/(1+x^2)^{1/2}$

4. What is the derivative of $(2x + 3)^5$?

○ A: $10(2x + 3)^4$ ○ B: $10(2x + 3)^6$
○ C: $5(2x + 3)^4$ ○ D: $5(2x + 3)^6$

5. dy/dx of f(x) = log(log (x)) is ?

(Please assume log as "Log to the base e" or Ln)

○ A: 1 / log x ○ B: x / log x
○ C: 1 / (x log x) ○ D: 2 / log x

6. $\frac{d}{dx} log(sin\, x) \quad = ?$

○ A: tan x ○ B: cot x
○ C: 1 / sin x ○ D: 1 / cos x

7. If $y=e^x$, then the rate of change of y with respect to x at point (0,1) is?

○ A: e ○ B: 1
○ C: -1 ○ D: 2

8. Under which of the following condition the given expression is true?

$$\frac{f(x_1) - f(x)}{x_1 - x} = f'(x)$$

○ A: As x approaches the value of x_1. ○ B: As x_1 approaches the value of x.
○ C: As x approaches the value of 0. ○ D: Both A and B.

9. $\lim\limits_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} \quad = ?$

○ A: f'(x) ○ B: ∫ f(x)dx
○ C: ∫ f'(x)dx ○ D: None of the above.

10. If y = 1/ x^2 then dy/dx at x = -2 is ?

○ A: ¼

○ B: 1

○ C: ½

○ D: -1/2

11. d/dx sin x at x = π/2 is?

○ A: 1

○ B: -1

○ C: √2/2

○ D: 0

12. d/dx ($\cos^2 x + \sin^2 x$) = ?

○ A: 2 sin x + 2 cos x

○ B: 0

○ C: 2 sin x cos x

○ D: 1

13. Which of the following statement is false?

○ A: d/dx c = 0 ; where c is a constant.

○ B: d/dx [c f(x)] = c d/dx f(x)

○ C: d/dx [f(x) * g(x)] = d/dx f(x) * d/dx g(x)

○ D: d/dx [f(x) + g(x)] = d/dx f(x) + d/dx g(x)

14. Who is/or thought to be the inventor of differential calculus and fundamental theorums of calculus?

○ A: Albert Einstien.

○ B: Isaac Newton.

○ C: Gottfried Leibniz

○ D: Both B and C.

15. Derivative of ln e^{4x} w.r.t x is?

○ A: 4

○ B: 4x

○ C: $1/e^{4x}$

○ D: e^{4x}

16. The slope of a curve at point P = 7. If dx = 0.01 and it is very close to P then dy =?

○ A: 0

○ B: 0.7

○ C: 0.07

○ D: 0.49

17. The equation of a line is y = 9/4 x - 33. What is the property of dy/dx?

○ A: It is increasing.

○ B: It is decreasing.

○ C: It is a constant value.

○ D: It is first increasing and then decreasing.

18. $\frac{d}{dx}x^n \;=?$

○ A: nx

○ B: nx^n

○ C: nx^{n-1}

○ D: $1/n+1\ x^{n+1}$

19. What is the derivative of 1/ $(ax + b)^n$?

○ A: $-n (ax + b)^{-n-1}$

○ B: $- an (ax + b)^{n-1}$

○ C: $-an (ax + b)^{-n-1}$

○ D: $-n (ax + b)^{n-1}$

20. $\lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} =?$

○ A: f' (x)

○ B: dy / dx

○ C: ∫ f''(x)dx

○ D: All of the above.

TEST 2

1. **If the tangent to the graph of f(x) at the point "a" makes an angle of 45° with the x-axis, then what is the value of f'(x)?**

○ A: 0 ○ B: 1
○ C: 2 ○ D: Not enough information.

2. **The function f(x) = cot (x) sin (x) has how many stationary points in the interval [0 , 2π]?**

○ A: 0 ○ B: 1
○ C: 2 ○ D: 3

3. **Which of the following is the correct expansion of sin x as Maclaurin series?**

○ A: $1 - x + x^2 - x^3$ .... ○ B: $x - x^3/3! + x^5/5! - x^7/7!$ .....
○ C: 1 + x/1! - 2x/2! + 3x/3! ..... ○ D: 1 + 0.1x + 0.01x + 0.001x ....

4. **Which of the following is not true?**

○ A: $a = d^2s/dt^2$ ○ B: a = dv/dt
○ C: $v = \int a\ dt$ ○ D: $v = \int s\ dt$

5. $\frac{d}{dx}(\frac{a+x}{a-x}) \ =?$

○ A: 0 ○ B: $2(a+x) / (a-x)^2$
○ C: $2a / (a-x)^2$ ○ D: $a / (a-x)^2$

6. **What are the two positive integers, whose sum is hundred and product is maximum?**

○ A: 30, 70 ○ B: 45, 55
○ C: 43, 57 ○ D: 50, 50

7. **Value of e is equal to which of the following infinite series?**

○ A: 1 + 1/1! + 1/2! + 1/3! ... ○ B: 1 + 0.1 + 0.01 + 0.001 ...
○ C: $1 - 1^3/3! + 1^5/5! - 1^7/7!$ .... ○ D: 1! - 2! + 3! - 4! ...

8. **What is the derivative of $(1 + \tan^2\theta)$ w.r.t tan θ?**

○ A: 2 sec θ ○ B: 2 tan θ
○ C: $\sec^2 \theta$ ○ D: $2 \tan\theta \sec^2\theta$

9. **Which of the following is not true for function $f(x) = |4 - x^2|$?**

○ A: Function value is always positive.
○ B: Function is continuous.
○ C: Function is differentiable at x = +2 and -2.
○ D: Its domain is the set of all real numbers.

10. $\frac{d}{dx}e^{e^x} \ =?$

○ A: $e^x e^{e^x}$ ○ B: e^{e^x}
○ C: e^{2x} ○ D: $1/e^x$

11. $\dfrac{d}{dx}tan^{-1}\sqrt{\dfrac{1-cos\,x}{1+cos\,x}}\ =?$

○ A: 1 ○ B: 2

○ C: ½ ○ D: -1/2

12. Maximum value of (ln x) / x is ?

○ A: 0 ○ B: 1

○ C: e ○ D: 1/e

The maximum area of a rectangle of perimeter 176 cm is?

○ A: 1854 cm^2 ○ B: 1936 cm^2

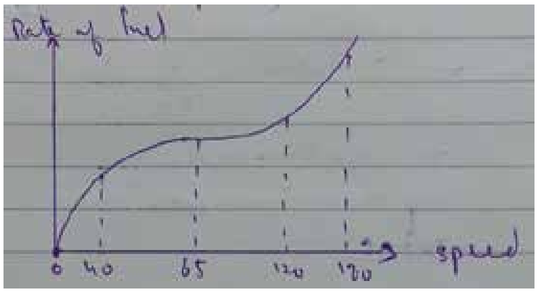
○ C: 2110 cm^2 ○ D: 3246 cm^2

13. What is the derivative of $(x^3+1)^9$?

○ A: $9(x^3+1)^8$ ○ B: $10(x^3+1)^{10}$

○ C: $9x^2\,(x^3+1)^8$ ○ D: $27x^2\,(x^3+1)^8$

14. The graph below shows the rate of fuel consumption with respect to the speed of the car. What is the most efficient speed with repect to the fuel consumption?



○ A: 40 ○ B: 65

○ C: 120 ○ D: 180

15. Critical point on the graph is the point for which?

○ A: f'(x) = 0 ○ B: f'(x) does not exist

○ C: f'(x) = 1 ○ D: Both A and B.

16. Derivative of an even function is always ?

○ A: An odd function ○ B: An even function

○ C: Negative function ○ D: Could be even or odd

17. If distance s of an object is given by the function $s=100t - 25t^2$, then what is the velocity at t= 1/2?

○ A: 25 ○ B: 50

○ C: 75 ○ D: 100

18. $x^2 + y^2 = 4$ is the equation of a circle. What is the slope at a point where x = 0?

○ A: 0 ○ B: 2

○ C: 4 ○ D: 1/2

19. If y = f(f(x)) ; f(0) = 0 and f'(0) = 1, then y'(0) is equal to ?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 1/2

TEST 3

1. If $y = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \_\_\_ \infty\right)$, then $\frac{dy}{dx} =$

○ A: 0 ○ B: 1

○ C: x ○ D: y

2. The function $x^3 + x^2 - 5x - 5$ is increasing at which interval?

○ A: (-infinity , - 5/3] ○ B: [1 , infinity)

○ C: [-5/3 , 1] ○ D: Both A and B.

3. d/dx cos(cos(cos x))) = ?

○ A: -sin [cos (cos x)].sin x cos x ○ B: - cos [sin (sin x)] sin x sin x

○ C: -sin [cos (cos x)] sin (cos x) sin x ○ D: sin [cos (cos x)] cos (cos x)

4. $\frac{d}{dx}[\cos^{-1}(4x^3 - 3x)] = ?$

○ A: $\frac{3}{\sqrt{1-x^2}}$ ○ B: $\frac{-3}{\sqrt{1-x^2}}$

○ C: $\frac{3}{\sqrt{1+x^2}}$ ○ D: $\frac{-3}{\sqrt{1+x^2}}$

5. y = |cos x| is not differentiable for x = ? (n in the given choices represent a set of integers)

○ A: nπ/2 ○ B: (2n+1) π/2

○ C: nπ ○ D: (n+1) π

6. If $y = e^{2x + 3 \log x}$, then dy/dx is equal to?

○ A: $x^2 e^{2x} (2x + 3)$ ○ B: $x^2 e^{2x} (2x - 3)$

○ C: $x^3 e^{2x}$ ○ D: $x^2 e^{2x} 2x$

7. If x > 0 and xy = 1, then the minimum value of (x + y) is?

○ A: -2 ○ B: -1

○ C: 1 ○ D: 2

8. The point at which the curve $y = x^3 - 4x + 3$ has gradient 8 is?

○ A: (2,3) ○ B: (4,5)

○ C: (1,0) ○ D: (0,1)

9. If x = (cos θ + θ sinθ), y = (sinθ - θ cos θ), then dy/dx is equal to ?

○ A: tan θ ○ B: cot θ

○ C: sin θ ○ D: cos θ

10. $\frac{d}{dx}\left(\tan^{-1}\sqrt{\frac{1+\cos x}{1-\cos x}}\right) = ?$

○ A: -1 ○ B: 1

○ C: ½ ○ D: -1/2

11. The graph f(x)=cot x has critical points at which of the following points in the interval [0,π]?

○ A: 0 and π
○ B: 0 and π/2
○ C: π and π/2
○ D: π/4 and π/2

12. The minimum value of (x^2 + 250/x) = ?

○ A: 75
○ B: 50
○ C: 5
○ D: The function has no minimum value.

13. tan x is ____ function in the interval [0,π/2]?

○ A: Increasing
○ B: Decreasing
○ C: Constant
○ D: Discontinuous

14. The function x^3 - 27x + 5 is increasing when?

○ A: |x| > 3
○ B: |x| < 3
○ C: x < -3
○ D: x > 3

15. If $y = \tan^{-1}(\sqrt{1+x^2} + x)$, then $\frac{dy}{dx} = ?$

○ A: $1 / 2(1+x^2)$
○ B: $-1 / 2(1+x^2)$
○ C: $1 / 2(1-x^2)$
○ D: $2 / (1-x^2)$

16. The point on the curve y = √x at which the tangent makes an angle of 45° with x axis is?

○ A: (1,1)
○ B: (1/16,1/4)
○ C: (4,2)
○ D: (1/4, 1/2)

17. If y = $12x^9 + 13x^7 + 5x^5$ +19 then which of the following is true?

○ A: $d^5y/dx^5 = 0$
○ B: $d^7y/dx^7 = 0$
○ C: $d^9y/dx^9 = 0$
○ D: $d^{10}y/dx^{10} = 0$

18. If x > 0, y > 0 and x + y = 18, then the maximum value of xy is?

○ A: 77
○ B: 81
○ C: 85
○ D: 144

19. If √x + √y = √a then dy/dx = ?

○ A: $(y/x)^{1/2}$
○ B: $(x/y)^{1/2}$
○ C: $-(y/x)^{1/2}$
○ D: $-(x/y)^{1/2}$

20. Derivative of $a^{\sqrt{x}}$ = ?

○ A: $a^{\sqrt{x}}$ ln a
○ B: $a^{\sqrt{x}}$
○ C: $a^{\sqrt{x}}$ / ln a
○ D: $a^{\sqrt{x}}$ ln a / 2√x

TEST 4

1. **What is $d^{19}y/dx^{19}$ if $y = e^{-x}$?**

○ A: e^{-x}
○ B: $-e^{-x}$
○ C: $19e^{-x}$
○ D: $-19e^{-x}$

2. **The position of an object is given by $x = 15t - 5t^3$ where x is the position. What is the acceleration of the object when it is momentarily at rest?**

○ A: 0
○ B: 1
○ C: 15
○ D: -30

3. **A rectangle has perimeter 100m. Its maximum area would be?**

○ A: 480 m^2
○ B: 625 m^2
○ C: 690 m^2
○ D: 765 m^2

4. **The maximum value of function f(x) = sin x cos x is?**

○ A: 1
○ B: 2
○ C: ½
○ D: 0

5. **If x = log t and $y = t^2 - 1$, then the value of d^2y/dx^2 at t = 1 is?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. **What is the second derivative of $(3t + 2)^{-2}$ with respect to t?**

○ A: $-6(3t + 2)^{-3}$
○ B: $6(3t + 2)^{-4}$
○ C: $54(3t + 2)^{-3}$
○ D: $54(3t + 2)^{-4}$

7. **What is the derivative of sin x w.r.t cos x?**

○ A: cos x
○ B: tan x
○ C: - cot x
○ D: - cos x sin x

8. **d/dx sin x^o = ? (x is in degrees)**

○ A: cos x^o
○ B: x cos x^o
○ C: $(-\pi/180)$ cos x^o
○ D: $(\pi/180)$ cos x^o

9. $\frac{d}{dx}e^{ln\, sin\, x^2} = ?$

○ A: $2x \cos x^2$
○ B: $x \cos x^2$
○ C: $\cos x^2$
○ D: 1/sinx * 2 $e^{\sin x}$

10. **If $d/dx\, (3x^3 + x) = d/dx\, (-3x^2 - 5)$ then x = ?**

○ A: 1 or 2
○ B: -1/3
○ C: 0 or -1/3
○ D: 0 or 1

11. **$d(x^x) / dx$ = ?**

○ A: x^x (1 + log x)
○ B: 1 + log x
○ C: log x
○ D: x log x

12. If $y = 3x^2 - 12x + 8$ then the slope of tangent at point (3,-1) is?

○ A: -18
○ B: 6
○ C: -19
○ D: 8

13. The curve y = sin (x) with domain = set of all real numbers has how many stationary points?

○ A: Infinite
○ B: 0
○ C: 1
○ D: 2

14. The derivative of e^x sinx w.r.t. e^x is

○ A: cos x + sin x
○ B: cos x
○ C: sin x
○ D: e^x(sin x + cos x)

15. If $\sin x = \frac{t}{\sqrt{1+t^2}}$, then $\frac{dx}{dt}$ is equal to

○ A: 1
○ B: $1 / (1+t^2)$
○ C: $1 / (1 - t)^{1/2}$
○ D: $1 / (1 + t^2)^{1/2}$

16. Differentiating $\ln(x^2 + 2x)$ w.r.t x gives?

○ A: $1 / (x^2+2x)$
○ B: ln (2x + 2)
○ C: (2x+2) / x
○ D: $(2x+2) / (x^2+2x)$

17. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \ldots \text{to } \infty}}}$, then $\frac{dy}{dx}$ is equal to

○ A: x / (2y - 1)
○ B: x / (2y + 1)
○ C: log x / (2y - 1)
○ D: 1 / x(2y - 1)

18. If $y = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ and $\theta = \tan^{-1}x$, then $\frac{dy}{d\theta} = ?$

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: x/2

19. What is the derivative of $(x^2 + 1)(x^3 + 7)$ w.r.t x is?

○ A: $5x^3 + 15x + 14$
○ B: $5x^4 + 3x^2 + 14x$
○ C: $6x^3$
○ D: $6x^3 + 7$

20. The graph of function y = x^3 has a _____ point at x = 0 ?

○ A: Inflection
○ B: Stationary
○ C: Turning
○ D: Both A & B.

Integration

TEST 1

1. $\int f(x)g'(x)\,dx = ?$

○ A: $f(x)g(x) - \int g(x)f'(x)\,dx$
○ B: $f(x)g(x) + \int g(x)f'(x)\,dx$
○ C: $f(x)g(x) - \int g'(x)f(x)\,dx$
○ D: $f(x)g(x) + \int g'(x)f(x)\,dx$

2. $\int \cot x\,dx = ?$

○ A: $\ln|\cos x| + c$
○ B: $\ln|\sec x| + c$
○ C: $\ln|\sin x| + c$
○ D: $\ln|\operatorname{cosec} x| + c$

3. $\int_0^{3\pi/2} cos(x)dx \ =?$

○ A: 0
○ B: 1
○ C: 3
○ D: -1

4. $\int \frac{\tan\sqrt{x}}{\sqrt{x}}\,dx =$

○ A: $\ln|\cos\sqrt{x}|$
○ B: $2\ln|\cos\sqrt{x}|$
○ C: $\ln|\sec\sqrt{x}|$
○ D: $2\ln|\sec\sqrt{x}|$

5. The solution of the differential equation $dy/dx = 2xy$ is?

○ A: $y = ce^{-x^2}$
○ B: $y = ce^{x^2}$
○ C: $y^2 = 2x^2 + c$
○ D: None of the above.

6. $\int_0^{\pi} sin(x)dx \ =?$

○ A: 0
○ B: 1
○ C: 2
○ D: $\sqrt{2}$

7. $\int (3x^2 - 2x + 1)\,dx = ?$

○ A: $x^3 - x^2 + 1 + c$
○ B: $x^3 - x + 1 + c$
○ C: $x^3 - x^2 + x + c$
○ D: $x^3 + x^2 + x + c$

$\int \sec x \tan x\,dx =?$

○ A: $\tan x + c$
○ B: $\cot x + c$
○ C: $\operatorname{cosec} x + c$
○ D: $\sec x + c$

8. $\int_{-2}^{3} x^2dx \ =?$

○ A: 8/3
○ B: 19/3
○ C: 28/3
○ D: 35/3

9. If $f(x) = x^2$ then find dy when $x = 3$ and $dx = 0.01$?

○ A: 0.02
○ B: 0.04
○ C: 0.06
○ D: 0.08

10. $\int tan^2 x\, dx \;\; =?$

○ A: $2 \tan x \sec^2 x + c$
○ B: $\tan x + x + c$
○ C: $\tan x - x + c$
○ D: None of the above.

11. $\int [f(x)]^{-1} f'(x)dx = ?$ $(f(x) > 0)$

○ A: $f(x) + c$
○ B: $\ln | \ln f(x) | + c$
○ C: $\ln f(x) + c$
○ D: $[f(x)]^{n+1} / (n+1)$

12. $\int_1^2 (2x^5 - x + 3)dx \;\; =?$

○ A: 45/2
○ B: 39/2
○ C: 17/2
○ D: None of the above.

13. $\int dx/(ax + b)$ =?

○ A: $\ln|ax + b| + c$
○ B: $1/a \ln|ax + b| + c$
○ C: $1/b \ln|ax + b| + c$
○ D: $1/a \ln|a| + c$

14. Which of the following mathematical function gives the area under the curve?

○ A: Differentiation
○ B: Integration
○ C: Vector product
○ D: Both B and C.

15. $\int x\, sinx\, dx \;\; =?$

○ A: $x \sin x + \cos x + c$
○ B: $- x \sin x + \cos x + c$
○ C: $x \cos x + \sin x + c$
○ D: $- x \cos x + \sin x + c$

16. $\int \frac{x}{(1+x^4)} dx =$

○ A: $\tan^{-1} x^2 + c$
○ B: $1/2 \tan^{-1} x^2 + c$
○ C: $\cot^{-1} x^2 + c$
○ D: $1/2 \cot^{-1} x^2 + c$

17. $\int (2x + 3)^{1/2} dx$ = ?

○ A: $1/3 (2x + 3)^{3/2} + c$
○ B: $1/2 (2x + 3)^{3/2} + c$
○ C: $1/3 (2x + 3)^{1/2} + c$
○ D: $2/3 (2x + 3)^{3/2} + c$

18. $\int \tan x \sec^2 x\, dx$ = ?

○ A: $\sec^2 x / 2 + c$
○ B: $\tan^2 x / 2 + c$
○ C: $\tan^2 x$
○ D: $1/2 (\cos x)^2$

19. What is the solution of the equation?

(sin y) (cosec x) dy/dx = 1

○ A: $\sin y = \sin x + c$
○ B: $\sin y = - \sin x + c$
○ C: $\cos y = \cos x + c$
○ D: $\cos y = - \cos x + c$

TEST 2

1. $\int \frac{1-x^2}{1+x^2}dx$ **= ?**

○ A: x + Tan^{-1} x + c
○ B: x - Tan^{-1} x + c
○ C: -x + 2Tan^{-1} x + c
○ D: -x - 2Tan^{-1} x + c

2. $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx \;\; =?$

○ A: 20/3
○ B: 14/3
○ C: 8/3
○ D: 5/3

3. The family of curve y = Ax + A^3 is represented by the differential equation of degree?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

4. $\int \frac{\cos x - \sin x}{\cos x + \sin x} dx \;\; =?$

○ A: - ln (cos x - sin x) + c
○ B: - ln (cos x + sin x) + c
○ C: ln (cos x - sin x) + c
○ D: ln (cos x + sin x) + c

5. $\int \frac{\cos x}{\sqrt{1 + \sin x}} dx = ?$

○ A: - $(1+\sin x)^{1/2}$ + c
○ B: $2(1+\sin x)^{1/2}$ + c
○ C: 0.5 $(1+\sin x)^{1/2}$ + c
○ D: - 0.5 $(1+\sin x)^{1/2}$ + c

6. $\int a^{\lambda x + y}$ **dx =?**

○ A: $1/(\lambda \ln a)\, a^{\lambda x + y}$ + c
○ B: $1/(\ln a)\, a^{\lambda x + y}$ + c
○ C: $1/(\lambda \ln a)\, a^{x + y}$ + c
○ D: $1/(\ln a)\, a^{x + y}$ + c

7. The order of a differential equation whose solution is y = a cos x + b sin x, where a and b are arbitrary constants, is?

○ A: 1
○ B: 2
○ C: 3
○ D: Cannot be determined.

8. $\int$ **x ln x dx = ?**

○ A: 0.5 x^2 (ln x - 0.5) + c
○ B: x^2 (ln x + 0.5) + c
○ C: 1.5 x (ln x + 1) + c
○ D: x^2 (ln x - x) + c

9. The order and the degree of the differential equation $d^2s/dt^2 + 4 = 0$ are?

○ A: Order is 2 and degree is 2
○ B: Order is 2 and degree is 3
○ C: Order is 1 and degree is 2
○ D: None of the above.

10. $\int$ **ln (tan x) $\sec^2$ x dx = ?**

○ A: ln (tan x) + tan x + c
○ B: tan x ln (tan x) - tan x + c
○ C: ln (tan x) - sec x + c
○ D: tan x ln (tan x) + tan x + c

11. $\int \frac{1-\tan^2 x}{1+\tan^2 x}\,dx =$

○ A: sin 2x　　○ B: 1/2 sin 2x

○ C: cos 2x　　○ D: 1/2 cos 2x

12. The solution of the differential equation $\frac{dy}{dx} + \frac{1+\cos 2y}{1-\cos 2x} = 0$ is

○ A: tan y + cot x = c　　○ B: tan y . cot x = c

○ C: tan y - cot x = c　　○ D: tan y = c . cot x

13. Which of the following is an ordinary differential equation?

○ A: $2y + 8x = \frac{d(cosx)}{dx}$　　○ B: $\frac{d(y+x)}{dx} = x^2 + sin\,x$

○ C: $\frac{d(cos\,x + tan\,x)}{dx} = x + 2y$　　○ D: All of the above.

14. ∫ $\sec^2$x cosec^2x dx = ?

○ A: tan x cot x　　○ B: tan x + cot x

○ C: tan x - cot x　　○ D: - tan x cot x

15. ∫ $\tan^2$ x dx = ?

○ A: tan x + x + c　　○ B: tan x - x + c

○ C: $\sec^2$ x - x + c　　○ D: cosec^2 x + x + c

16. $\int \frac{1}{(1+x^2)Tan^{-1}x}dx \;=?$

○ A: 1/x ln |Tan^{-1} x| + c　　○ B: -1/x ln |Tan^{-1} x| + c

○ C: - ln |Tan^{-1} x| + c　　○ D: ln |Tan^{-1} x| + c

17. The solution of the differential equation y dy/dx = x - 1, satisfying x = 1 and y = 1, is?

○ A: $y^2 = 2x^2 - x – 1$　　○ B: $y^2 = x^2 - 2x + 2$

○ C: $y = x^2 - 2x + 3$　　○ D: $y^2 = 2x^2 - x - 3$

18. $\int ln\,x\,dx \;=?$

○ A: x (1 – ln x) + C　　○ B: x (ln x - 1) + C

○ C: (1 + x) ln x + C　　○ D: (1 - x) ln x + C

19. A particle moves in a straight line with a velocity given by dx/dt = x + 1 (x is the distance described). The time taken by a particle to traverse a distance of 99 meters is?

○ A: log 10e　　○ B: 2 $\log_e$ 10

○ C: 2 log 10 e　　○ D: 0.05 log10 e

20. The number of arbitrary constants in the second order differential euqation is?

○ A: 0　　○ B: 1

○ C: 2　　○ D: Infinite

TEST 3

1. $\int \frac{cos2x - 1}{1 + cos2x} dx \;\; =?$

○ A: - tan x + x + c
○ B: tan x + x + c
○ C: x - sec x + c
○ D: x + sec x + c

2. $\int e^{-ln\, x}\, dx \;\; =?$

○ A: $e^{-\ln x}$
○ B: ln |x|
○ C: $-e^{-\ln x}$
○ D: $-x\, e^{-\ln x}$

3. $\int_0^1 \frac{dx}{(1+x^2)^{3/2}} \;\; =?$

○ A: 1
○ B: √2
○ C: 1/√2
○ D: 3/√2

4. The solution of the equation $(e^x + 1)y\, dy = (y + 1)e^x\, dx$ is ?

○ A: $y = e^x(e^x + 1) + C$
○ B: $(y + 1) = e^{2x} + C$
○ C: $y = e^x / x + C$
○ D: $C\,(1 + y)(1 + e^x) = e^y$

5. The differential equation of all circles of radius 'r' is of order?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. What is the solution of the differential equation,

$(x\sqrt{1+y^2})dx + (y\sqrt{1+x^2})dy = 0$

○ A: $(1+y^2)^{1/2} + (1 + x^2)^{1/2} = c$
○ B: $\log (1 + y^2) + \log (1 + x^2) = 2c$
○ C: $\sin^{-1} y + \sin^{-1} x = c$
○ D: $\tan^{-1} y + \tan^{-1} x = c$

7. $\int \frac{e^{tan^{-1}x}dx}{1+x^2}$ **= ?**

○ A: $xe^{tan^{-1}x} + c$
○ B: $(tan^{-1}x)e^{tan^{-1}x} + c$
○ C: $tan^{-1}x + c$
○ D: $e^{tan^{-1}x} + c$

8. $\int_0^{2\pi} cos^2\theta\, d\theta \;\; =?$

○ A: π
○ B: 2π
○ C: 3π/2
○ D: 3

9. $\int_0^{\pi} \sqrt{1 + sin\; x}\, dx \;\; =?$

○ A: 2
○ B: 4
○ C: √2
○ D: 2√2

10. $\int |x|\, dx = ?$

○ A: $x^2 / 2$
○ B: $- x^2 / 2$
○ C: $x |x| / 2$
○ D: 1

11. $\int \frac{\sec x \operatorname{cosec} x}{\log \tan x} dx =$

○ A: $\log [\log \tan x] + C$
○ B: $\cot (\log x) + C$
○ C: $\tan (\log x) + C$
○ D: None of the above.

12. If $\int x^6 \sin(5x^7) dx = \frac{k}{5} \cos(5x^7),\ x \neq 0$, then

○ A: $k = -1/7$
○ B: $k = 1/7$
○ C: $k = -7$
○ D: $k = 7$

13. $\int \frac{dx}{e^x + e^{-x}} \ =?$

○ A: $\log (e^x + 1) + C$
○ B: $\log (e^x + e^{-x}) + C$
○ C: $\tan^{-1} e^x + C$
○ D: $\sin^{-1} e^x + C$

14. The value of $\int \frac{(x - x^3)^{1/3}}{x^4} dx$ is

○ A: $(3/8) (1/x^2 - 1)^{4/3} + C$
○ B: $- (3/8) [(1/x^2) - 1]^{4/3} + C$
○ C: $(1/8) (1 - 1/x^2)^{4/3} + C$
○ D: $- (1/8) (1 - 1/x^2)^{4/3} + C$

15. $\int \frac{\cos x}{\sin x . \ln \sin x} dx \ =?$

○ A: $- \ln |\ln \sin x|\, dx$
○ B: $- \ln |\ln \cos x|\, dx$
○ C: $\ln |\ln \sin x|\, dx$
○ D: $\ln |\ln \cos x|\, dx$

16. $\int_0^{2\pi} \sqrt{1 + \sin(x/2)}\, dx \ =?$

○ A: 2
○ B: 4
○ C: 8
○ D: 0

17. $\int \sin^{-1} x\, dx \ =?$

○ A: $x \cos^{-1} x + (1 - x^2)^{1/2} + C$
○ B: $x \sin^{-1} x + C$
○ C: $x \sin^{-1} x + (1 - x^2)^{1/2} + C$
○ D: $- \sin^{-1} x + (1 - x^2)^{1/2} + C$

18. $\int_0^{\pi/2} \sin x\, e^{\cos x} dx \ =?$

○ A: 1
○ B: e - 1
○ C: e
○ D: -1

19. $\int \frac{xe^x}{(1+x)^2}dx \ =?$

○ A: $(1 + 2x\ e^x) / (1 + x)$ ○ B: $(1 - 2x\ e^x) / (1 + x)$

○ C: $- e^x / (1+x)$ ○ D: $e^x / (1+x)$

20. The equation of the curve through the point (1, 0) and whose slope is $\frac{y-1}{x^2 - x}$ is

○ A: $(y - 1)(x + 1) + 2x = 0$ ○ B: $2x(y - 1) + x + 1 = 0$

○ C: $x(y - 1)(x + 1) + 2 = 0$ ○ D: $y(y - 1)(x - 1) + 2 = 0$

TEST 4

1. $\int \sqrt{1 + cos(x/4)}\, dx \ =?$

○ A: $8\sqrt{2} \sin(x/8) + C$ ○ B: $- 8\sqrt{2} \sin(x/8) + C$

○ C: $8\sqrt{2} \cos(x/8) + C$ ○ D: $- 8\sqrt{2} \cos(x/8) + C$

2. $\int_0^{\pi/2} sin^2x\, dx \ =?$

○ A: π ○ B: π/2

○ C: π/3 ○ D: π/4

3. $\int_0^{\pi} \sqrt{1 - cos\, x}\, dx \ =?$

○ A: 1 ○ B: $\sqrt{2}$

○ C: $2\sqrt{2}$ ○ D: 2

4. $\int_0^{\pi/2} sin(x) sin(2x) dx \ =?$

○ A: 1/3 ○ B: 2/3

○ C: 1 ○ D: pi

5. Which of the following statement is false?

○ A: The degree of the differential equation is the highest power of the highest order differential coefficient occurring in it.

○ B: The order of the differential equation is the highest order derivative occurring in the equation.

○ C: The order of a differential equation is unique.

○ D: The order of a differential equation is any integer.

6. **$\int \cos \sqrt{x}\, dx = ?$**

○ A: $[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$ ○ B: $2[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$

○ C: $[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$ ○ D: $2[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$

7. The differential equation $x\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y = x^2$ is of

○ A: Degree 4 and order 2
○ B: Degree 4 and order 3
○ C: Degree 3 and order 2
○ D: Degree 2 and order 3

8. What is the solution of the differential equation?

$x\,dy + y(x - 1)dx = 0$

○ A: $y = c\,xe^{x}$
○ B: $y = c\,xe^{-x}$
○ C: $y = c\,e^{-x}$
○ D: $y = c\,xe^{x+1}$

9. $\int [f(x)]^n f'(x)\,dx = ?$

○ A: $\ln f(x) + c$
○ B: $- \ln f(x) + c$
○ C: $[f(x)]^{n+1} / (n+1)$
○ D: $[f(x)]^{n} / (n+1)$

10. $\int x^2 e^{x^3} \cos(e^{x^3})dx$ is equal to

○ A: $\frac{1}{3}sin(e^{x^3}) + c$
○ B: $sin(e^{x^3}) + c$
○ C: $3sin(e^{x^3}) + c$
○ D: $-sin(e^{x^3}) + c$

11. If $dr/dt = - rt$ and $r(0) = r_0$, then which of the following is correct?

○ A: $r = r_o e^{-t}$
○ B: $r = r_o e^{-t/2}$
○ C: $r = r_o e^{-t.t}$
○ D: $r = r_o e^{-t.t/2}$

12. $\int \frac{e^{2x} + e^{x}}{e^{x}} dx \;\; =?$

○ A: $e^x + 1 + c$
○ B: $2x\,e^x + c$
○ C: $e^{2x} + 1 + c$
○ D: $e^x + x + c$

13. δy for any function $f(x)$ is given by?

○ A: $f(\delta x)$
○ B: $f(x + \delta x)$
○ C: $f(x + \delta x) + f(x)$
○ D: $f(x + \delta x) - f(x)$

14. $\int_0^{\pi/2} cos^2x\,dx \;\; =?$

○ A: π
○ B: $\pi/2$
○ C: $\pi/3$
○ D: $\pi/4$

15. The solution of the equation $y\,dx + x\,dy = 0$ is?

○ A: $xy = c$
○ B: $x/y = c$
○ C: $x + y = c$
○ D: $x - y = c$

Analytic Geometry

TEST 1

1. Equation of a line parallel to x axis at a distance 'a' below the x axis is?

○ A: x = a
○ B: x = - a
○ C: y = - a
○ D: y = a

2. What is the equation of a line perpendicular to a line with slope = -6? The line has y intercept of 4/3.

○ A: y = x + 8
○ B: y = -6x + 4/3
○ C: 6y = x + 8
○ D: y = x + 3/4

3. The angle bisectors of a triangle are?

○ A: Perpendicular
○ B: Concurrent
○ C: Non-concurrent
○ D: Parallel

4. The equation of family of lines perpendicular to line 3x + 4y + 7 = 0, is?

○ A: 4x + 3y + k = 0
○ B: 4x - 3y + k = 0
○ C: 3x - 4y + k = 0
○ D: 3x + 4y + k = 0

5. If m_1 and m_2 are the slopes of the perpendicular lines. Which of the following is true?

○ A: $m_1 = m$
○ B: $m_1 = - m_2$
○ C: $m_1m_2 -1 = 0$
○ D: $m_1m_2 +1 = 0$

6. Angle between lines $2x^2 - 7xy + 3y^2 = 0$, is?

○ A: 45°
○ B: 60°
○ C: 90°
○ D: 30°

7. What is the distance between the points A (7,5) and B (2,-6) ?

○ A: √73
○ B: √146
○ C: √183
○ D: √219

8. Equation of x axis is?

○ A: y = 0
○ B: x = 0
○ C: x = y
○ D: y = 1

9. What is the y intercept of the line x - √3y + 10 = 0

○ A: 10/√3
○ B: -10/√3
○ C: 10
○ D: -10

10. The mid point of line joining points A (3 ,1) and B(-2,-4) is?

○ A: (5/2 , 5/2)
○ B: (3/2, 1/2)
○ C: (-1, -2)
○ D: (1/2 , -3/2)

11. If inclination of a line is 45° then the slope is?

○ A: 0
○ B: 1
○ C: -1
○ D: Infinity.

12. The point (-4,-2) lies on a circle. What is the length of the radius of this circle if the center is located at (-8,-10)?

○ A: √47 ○ B: √80

○ C: √95 ○ D: √108

13. If two medians of a triangle ABC pass through point (1,-2) then the third median pass through?

○ A: (0,0) ○ B: (-2,1)

○ C: (-1,-2) ○ D: None of the above.

14. Which of the following statement is true about any triangle?

○ A: Altitudes and right bisectors are concurrent.

○ B: Altitudes and right bisectors are non-concurrent.

○ C: Altitudes are concurrent and right bisectors are not concurrent.

○ D: Altitudes are not concurrent and right bisectors are concurrent.

15. If m_1 and m_2 are the slopes of two lines then the tangent of angle between the lines is equal to?

○ A: $(m_2 - m_1) / (1 - m_1m_2)$ ○ B: $(m_2 + m_1) / (1+m_1m_2)$

○ C: $(m_2 + m_1) / (1 - m_1m_2)$ ○ D: $(m_2 - m_1) / (1+m_1m_2)$

16. In the straight equation x cos a + y sin a = P, P represents?

○ A: Y intercept ○ B: X intercept

○ C: Mid point of the line. ○ D: Length of perpendicular from the origin to the line

17. What is the point of intersection for 5x + 7y = 35 and 3x - 7y = 21?

○ A: (5,7) ○ B: (7,0)

○ C: (3,-7) ○ D: (4,3)

18. If points A(a,b) ; B(c,d) and C(e,f) are collinear. Then the area of the triangle ABC is?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

19. The point p (x,y) such that x>0 and y <0 lies in?

○ A: Quadrant I ○ B: Quadrant II

○ C: Quadrant III ○ D: Quadrant IV

20. What is the slope of the line ax + by + c = 0?

○ A: 0 ○ B: Infinite

○ C: -c/b ○ D: -a/b

TEST 2

1. What is the symmetric form of the equation 5x - 12y + 39 = 0?

○ A: $\frac{x + 39/5}{12/13} = \frac{y}{5/13}$

○ B: $(-5/13)x + (12/13)\,y = 3$

○ C: $(-5/39)x + (12/39)\,y = 1$

○ D: $y = (5/12)\,x + (39/12)$

2. The equation of line parallel to x-axis and bisecting the join of (1, 4) and (− 2, 6) is?

○ A: $y = 3$

○ B: $y = 5$

○ C: $y + 2 = 5$

○ D: $x = 5$

3. What is the equation of a line passing through the point (4,2) and parallel to the line connecting points (0,-1) and (7,-15)?

○ A: $y + 2x + 10 = 0$

○ B: $y + 2x - 10 = 0$

○ C: $2y + 3x - 7 = 0$

○ D: $2y + 3x + 7 = 0$

4. The two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if?

○ A: $a_1b_2 - a_2b_1 = 0$

○ B: $a_1a_2 - b_1b_2 = 0$

○ C: $a_1b_2 + a_2b_1 = 0$

○ D: $a_1a_2 + b_1b_2 = 0$

5. The three lines $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if and only if?

○ A: $a_1 = a_2 = a_3$ and $b_1 = b_2 = b_3$ and $c_1 = c_2 = c_3$

○ B: $a_1 + b_1 + c_1 = 0$

○ C:

○ D:

6. If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then?

○ A: a = 0, b = 4

○ B: a = 3, b = 4

○ C: a = 2, b = 3

○ D: a = 3, b = 5

7. The equation of general form $ax^2 + 2hxy + by^2$ represents?

○ A: A line

○ B: A curve

○ C: A pair of lines

○ D: A pair of lines through the origin

8. Centroid of a triangle divides each median in the ratio?

○ A: 1:1

○ B: 1:2

○ C: 2:1

○ D: 1:3

9. Find the radius of a circle whose diameter has endpoints (-3, -2) and (7, 8)?

○ A: $10\sqrt{2}$

○ B: $2\sqrt{10}$

○ C: $5\sqrt{2}$

○ D: $2\sqrt{5}$

10. The angle between the pair of lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$ is?

○ A: None of the above.

○ B: $\tan^{-1}(4/3)$

○ C: $\tan^{-1}(11/3)$

○ D: $\tan^{-1}(7/3)$

11. Of $P_1(x_1,y_1)$ and $P_2=(x_2,y_2)$ are two points such that line joining P_1P_2 is parallel to x axis then?

○ A: $x_1 = x_2$
○ B: $y_1 = x_2$
○ C: $x_1 = y_2$
○ D: $y_1 = y_2$

12. The equation of a straight line that intersects x axis at point 2 and y axis at point -4 is?

○ A: $y - 2x + 4 = 0$
○ B: $y - 2x - 4 = 0$
○ C: $2x - y + 4 = 0$
○ D: $x - 2y + 4 = 0$

13. For a pair of lines represented by general equation $ax^2 + 2hxy + by^2$, if $h^2 > ab$ then?

○ A: Lines are real and distinct.
○ B: Lines are real and coincident.
○ C: Lines are imaginary.
○ D: Lines do not pass through the origin.

14. What is the equation of the line intersecting $3x - 4y - 10 = 0$ and $x + 2y - 10 = 0$ and having a zero slope?

○ A: $2x + 3y - 18 = 0$
○ B: $y = 2$
○ C: $x = 9$
○ D: $2x + 3y + 18 = 0$

15. Slope of a line is negative if the angle z it froms with the x axis is?

○ A: $z = 0$
○ B: $z > 90$
○ C: $0 < z < 90$
○ D: $90 < z < 180$

16. If three points A(a,b), B(c,d) and C(e,f) are collinear then?

○ A: Slope of AB is not equal to the slope of BC
○ B: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$
○ C: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 1$
○ D: None of the above.

17. The equation below shows which form of the straight line equation?

$$\frac{x - x_1}{\cos\alpha} = \frac{y - y_1}{\sin\alpha}$$

○ A: Normal form
○ B: Two point form
○ C: Symmetric form
○ D: Point slope form

18. What is the distance between two parallel lines $2x - 5y + 13 = 0$ and $2x - 5y + 6 = 0$?

○ A: 3/28
○ B: 9/32
○ C: $7/\sqrt{29}$
○ D: $4/\sqrt{63}$

19. What is the normal form of the straight line equation $5x - 12y + 39 = 0$?

○ A: This equation cannot be represented in the two point form.
○ B: $y = (5/12)\,x + 39/12$
○ C: $(-5/39)\,x + (12/39)\,y = 1$
○ D: $(-5/13)\,x + (12/13)\,y = 3$

20. The points of line $|x| = |y|$ may lie in which quadrant?

○ A: Quadrant I
○ B: Quadrant I & III
○ C: Quadrant II and IV
○ D: Quadrant I, II , III or IV

TEST 3

1. **Find the value of k in the equation (3x - 4y - 10) + k(x + 2y - 10) = 0 such that the line is perpendicular to a line with slope 3/4?**

   ○ A: 4 ○ B: 5

   ○ C: 6 ○ D: 7

2. **The pair of lines represented by the equation $2x^2 + 49xy - 2y^2$are?**

   ○ A: Imaginary. ○ B: Parallel

   ○ C: Perpendicular ○ D: None of the above.

3. **The straight lines given below form what kind of triangle?**

   x + y - 4 = 0, 3x + y - 4 = 0, x + 3y - 4 = 0

   ○ A: Isoceles ○ B: Equlateral

   ○ C: Right angled ○ D: None of the above.

4. **Pair of lines represented by the equation $2x^2 + 8xy + 8y^2$ are?**

   ○ A: Real and distinct. ○ B: Real and coincident.

   ○ C: Imginary. ○ D: None of the above.

5. **What is the value of h such that points (-1,h) , (3,2) and (7,3) are collinear?**

   ○ A: 1 ○ B: 2

   ○ C: 3 ○ D: 4

6. **The lines px + qy + r = 0, qx + ry + p = 0, rx + py + q = 0 are concurrent if?**

   ○ A: p + q + r = 0 ○ B: $p^2 + q^2 + r^2 + pq + qr + rp = 0$

   ○ C: $p^2 + q^2 + r^2 + 3pqr = 0$ ○ D: All of the above.

7. **The equation of base of an equilateral triangle is x + y = 2 and the vertex opposite to this base is (2, − 1). Then the length of the side of triangle equals?**

   ○ A: √3 ○ B: √1 / √3

   ○ C: √2 / √3 ○ D: √3 / √2

8. **For a pair of Imaginary lines represented by the equation $ax^2 + 2hxy + by^2$. Which of the following is true?**

   ○ A: The imaginary lines never intersect.

   ○ B: They intersect at (0,0) ○ C: They intersect at postivie y axis.

   ○ D: They intersect at negative y axis.

9. **If vertices of triangle ABC are A(2,2), B(-4,-4) and C(5,-8). Then the length of median through C is?**

   ○ A: √65 ○ B: √75

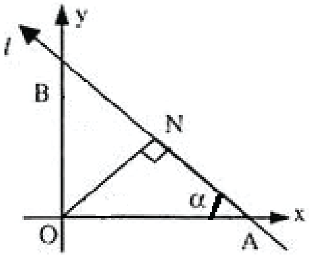
   ○ C: √85 ○ D: √95

10. **For a pair of lines represented by the equation $3x^2 + 4xy + 9y^2$, the lines are?**

   ○ A: Real and distinct. ○ B: Real and coincident.

   ○ C: Imaginary. ○ D: Not passing through the origin.

11. What the equation of a line at a distance 5 units from the origin, having angle $\alpha = 30^o$ as shown in the figure below?



○ A: $\sqrt{3}x + y = 10$
○ B: $x + \sqrt{3}y = 10$
○ C: $\sqrt{3}x + y = 5$
○ D: $x + \sqrt{3}y = 5$

12. Which of the following is true about the two points (0,0) and (-4,7) with respect to the line $2x - 3y + 6 = 0$?

○ A: They both lie on the line.
○ B: They both lie above the line.
○ C: They both lie below the line.
○ D: They lie on the opposite sides of the line.

13. What is the radius of circle inscribed in the triangle formed by lines $x = 0$, $y = 0$ and $4x + 3y - 24 = 0$?

○ A: 2
○ B: $2\sqrt{2}$
○ C: 3
○ D: 4

14. Equation of the right bisector of the line segment joining points (7,4) and (-1,-2) is?

○ A: $4x + 3y - 10 = 0$
○ B: $4x + 3y - 15 = 0$
○ C: $3x - 4y + 7 = 0$
○ D: $3x - 4y - 7 = 0$

15. The line segment joining the point (-3,-4) and (1,-2) is divided by the y axis in ratio?

○ A: 1:1
○ B: 2:1
○ C: 3:1
○ D: 4:1

16. If the coordinates of the mid point of the triangle are (1,-1), (2,3) and (3,2) then the area of triangle is?

○ A: 3/2
○ B: 9/2
○ C: 6
○ D: 11/2

17. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form which of the following triangles?

○ A: Isoceles
○ B: Equilateral
○ C: Right Angled
○ D: None of the above.

18. Points A(1, 3) and C(5, 1) are opposite vertices of a rectangle ABCD. If the slope of BD is 2, then its equation is

○ A: $2x - y = 4$
○ B: $2x + y = 4$
○ C: $2x + y = 7$
○ D: $2x - y = -7$

19. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product then c has the value?

○ A: -1
○ B: 1
○ C: -2
○ D: 2

20. Equation of the line passing through the point (1,-2) and cutting off equal intercepts from the axis would be?

○ A: $x + y = 1$

○ B: $x + y + 1 = 0$

○ C: $x - y = 1$

○ D: $x - y + 1 = 0$

TEST 4

1. For a pair of lines represented by the equation $ax^2 + 2hxy + by^2$, which of the following is true if the lines are parallel?

○ A: $h^2 = 0$

○ B: $h^2 > ab$

○ C: $h^2 < ab$

○ D: $h^2 - ab = 0$

2. If point A (-1,2) is the center of a circle and point B (7,5) lies on the circle. The diameter of circle is?

○ A: 9

○ B: $\sqrt{45}$.

○ C: $\sqrt{73}$.

○ D: $2\sqrt{73}$

3. The coordinate axis is changed through the point O' (2,3). If coordinates of a point P in new axis are (-1,4) then the original coordinates of P were?

○ A: (0,0)

○ B: (2,3)

○ C: (1,7)

○ D: (3,-1)

4. The point P (x,y) with $x<0$ and $y<0$ lies in which quadrant?

○ A: Quadrant I

○ B: Quadrant II

○ C: Quadrant III

○ D: Quadrant IV

5. What are the new coordinates of the point P(5,3), if the axis is rotated by angle 45°?

○ A: (4,2)

○ B: $(\sqrt{2}, 2\sqrt{2})$

○ C: $(2\sqrt{2}, -\sqrt{2})$

○ D: $(4\sqrt{2}, -\sqrt{2})$

6. Inclination of the line $y = -x$ is?

○ A: 45°

○ B: 135°

○ C: 225°

○ D: 315°

7. What is the angle between the lines L_1 joining points (1,-7) and (6,-4) and L_2 joining points (-1,2) and (-6,-1)?

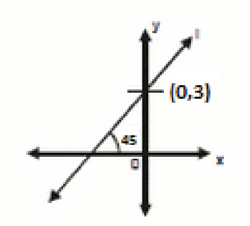
○ A: 0

○ B: 30

○ C: 45

○ D: 60

8. The equation of the line given below is?



○ A: $y = 3x - 1$

○ B: $y = 3x + 1$

○ C: $y + x = 3$

○ D: $y = x + 3$

9. **Two sides of an isosceles triangle are given by the equation $7x - y + 3 = 0$ and $x + y - 3 = 0$. If its third side passes through the point (1, – 10), then its equations are**

○ A: $x - 3y - 31 = 0$ or $3x + y + 7 = 0$ ○ B: $x - y - 31 = 0$ or $x + y + 7 = 0$

○ C: $2x - 3y - 11 = 0$ or $x + 4y + 9 = 0$ ○ D: $x + y + 1 = 0$ or $5x - y + 10 = 0$

10. Equation of the line through the point (2,3) and perpendicular to the line joining (-5,6) and (-6,5) is given by?

○ A: $x - y + 5 = 0$ ○ B: $x + y + 5 = 0$

○ C: $x - y - 5 = 0$ ○ D: $x + y - 5 = 0$

11. The extremities of diagonal of a parallelogram are the points (3, − 4) and (− 6, 5). If the third vertex is (− 2, 1), then the fourth vertex will be?

○ A: (0,1) ○ B: (1,0)

○ C: (1,1) ○ D: (-1,0)

12. Orthocenter of a triangle is defined as the point of intersection of?

○ A: Altitudes ○ B: Angle bisectors

○ C: Medians ○ D: None of the above.

13. If the lines represented by equation $Ax^2 + 2Hxy + By^2 = 0$ are perpendicular, then?

○ A: $A + H = 0$ ○ B: $A + B = 0$

○ C: $H = 0$ ○ D: $A/B = H/B$

14. What is the equation of the lines passing through the point (-5,-3) and (9,-1) ?

○ A: $x - 7y - 16 = 0$ ○ B: $x - 7y + 16 = 0$

○ C: $x + 7y + 16 = 0$ ○ D: $x + 7y - 20 = 0$

15. The diagonals of a parallelogram PQRS are along the lines $x + 3y = 4$ and $6x – 2y = 7$. Then PQRS must be a?

○ A: General parallelogram ○ B: Rectangle

○ C: Rhombus ○ D: None of the above.

16. A line passes through point (4, 1) and is perpendicular to line $3x + y = 3$, then its x − intercept is?

○ A: ½ ○ B: 2/3

○ C: 1 ○ D: 3/2

17. The line passing through point (1,2) and perpendicular to $x + y + 1 = 0$ is?

○ A: $y - x + 1 = 0$ ○ B: $y - x - 1 = 0$

○ C: $y - x + 2 = 0$ ○ D: $y - x - 2 = 0$

18. Distance between two lines defined by $x + 3 = 0$ and $x - 3 = 0$ is?

○ A: 0 ○ B: 3

○ C: 6 ○ D: 9

19. M is the midpoint of line AB. The coordinates of A are (-2,3) and the coordinates of M are (1,0). The coordinates of B are?

○ A: (-1/2,3/2)	○ B: (4,-3)
○ C: (4,6)	○ D: (-4,-3)

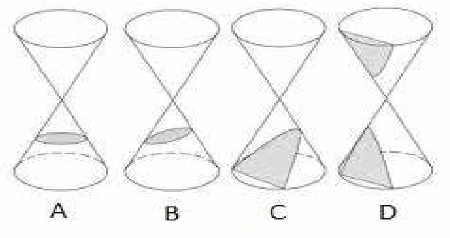
20. If a line passing through the points (x_1, y_1) and (x_2, y_2) such that $x_1 = x_2$ then the slope of the line is?

○ A: Zero	○ B: Positive
○ C: Negative	○ D: Undefined

Conic Sections

TEST 1

1. **Which of the following cutting of a cone represents a circle?**



○ A: A　　○ B: B

○ C: C　　○ D: D

2. **Eccentricity of ellipse is?**

○ A: Equal to 1.　　○ B: Greater than zero and less than 1.

○ C: Greater than one.　　○ D: Zero

3. **Center and radius of the circle represented by $x^2 + y^2 = 9$ is?**

○ A: (1,1) and 9　　○ B: (1,1) and 3

○ C: (0,0) and 9　　○ D: (0,0) and 3

4. **Equation of a circle cannot have a term?**

○ A: x　　○ B: y

○ C: xy　　○ D: All of the above.

5. **The center of the circle represented by the equation $(x - 3)^2 + (y + 4)^2 = 4$ is?**

○ A: (3,4)　　○ B: (-3,-4)

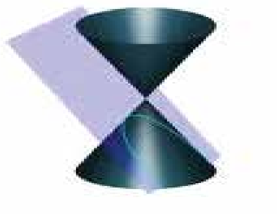
○ C: (-3,4)　　○ D: (3,-4)

6. **What is the focus of the ellipse $x^2/16 + y^2/4 = 1$?**

○ A: $(\pm 2\sqrt{3}, 0)$　　○ B: $(\pm \sqrt{3}, 0)$.

○ C: $(\pm 2\sqrt{5}, 0)$.　　○ D: $(\pm \sqrt{5}, 0)$.

7. **The plane cutting a double cone as shown in the figure below would get a/an?**



○ A: Circle　　○ B: Parabola

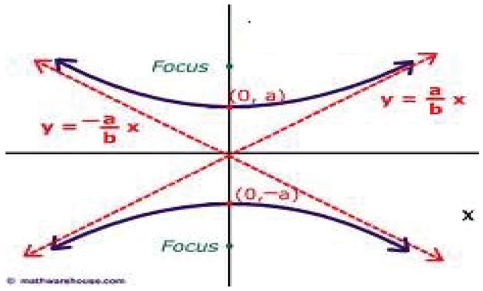
○ C: Hyperbola　　○ D: Ellipse

8. **The equation $x^2/a^2 + y^2/b^2 = 1$ represents a verticle ellipse if?**

○ A: $a^2 = b^2$　　○ B: $a^2 < b^2$

○ C: $a^2 > b^2$　　○ D: None of the above.

9. The equation of the given hyperbola is of form?



○ A: $x^2/a^2 + y^2/b^2 = 1$ ○ B: $x^2/b^2 + y^2/a^2 = 1$

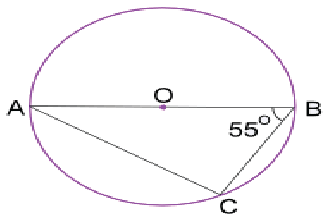
○ C: $x^2/a^2 - y^2/b^2 = 1$ ○ D: $y^2/a^2 - x^2/b^2 = 1$

10. When the cutting of a conic section is parallel to the axis of the cone and intersects both nappes, it represents a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

11. What is angle CAB in the given figure?



○ A: 35° ○ B: 45°

○ C: 55° ○ D: 65°

12. A line $y = mx + c$ intersects a circle $x^2 + y^2 = a^2$. The point of intersection are imaginary if?

○ A: $a^2 (1+m^2) - c^2 > 0$ ○ B: $a^2 (1+m^2) - c^2 = 0$

○ C: $a^2 (1+m^2) - c^2 < 0$ ○ D: Intersection points are never imaginary.

13. If a circle is represented by the equation $x^2 + y^2 + 4x - 6y - 12 = 0$. Then the point (-5,6) is?

○ A: Inside the circle ○ B: Outside the circle.

○ C: On the circle. ○ D: Center of the circle.

14. Circle is a special case of ellipse with eccentricity = ?

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

15. The parametric form of equation ($a \cos \Theta$, $b \sin \Theta$) is for?

○ A: Circle ○ B: Hyperbola

○ C: Ellipse ○ D: Parabola

16. Equation of the directrices of hyperbola $y^2/a^2 - x^2/b^2 = 1$ is given by?

○ A: $x = \pm c/e^2$ ○ B: $x = \pm b/e$

○ C: $y = \pm c/e^2$ ○ D: $y = \pm b/e$

17. If e > 1 then the conic section is a?

○ A: Parabols ○ B: Ellipse

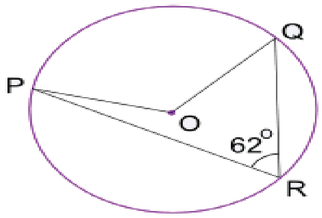
○ C: Hyperbola ○ D: Circle.

18. If a plane cutting one section of a double cone is slightly tilted and not parallel to the generator of the cone, we get a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

19. What is the angle POQ in the given diagram?



○ A: 62° ○ B: 102°

○ C: 124° ○ D: 132°

20. Focal chord perpendicular to the axis of the parabola is called?

○ A: Directrix. ○ B: Tangent Chord

○ C: Latusrectum. ○ D: Vertex.

TEST 2

1. **For a general form of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius is given by**?

○ A: g + f + c ○ B: $\sqrt{g^2 + f^2}$

○ C: $\sqrt{g^2 + f^2 - c}$ ○ D: $\sqrt{g^2 + f^2 + c}$

What is the eccentricity of the ellipse given by equation $x^2/9 + y^2/4 = 1$?

○ A: 5/3 ○ B: √5/3

○ C: 2/3 ○ D: √2/3

2. **The equations $x = at^2$, $y = at$; $t \in R$ represents?**

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

3. **Intersecting properties of conic sections were discovered by?**

○ A: Pythagoras ○ B: Eudoxus and Georg Cantor

○ C: Euclid ○ D: Apollonius and Pappus

4. **What are the coordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$?**

○ A: (2,-1) ○ B: (2,1)

○ C: (-2,-1) ○ D: (2,0)

5. **What is the focus of the parabola $4x - y^2 = 2y + 13$?**

○ A: (3,-1) ○ B: (3,1)

○ C: (4, 1) ○ D: (4, -1)

6. What are the foci of hyperbola $x^2/9 - y^2/4 = 1$?

○ A: $(\pm\sqrt{5}, 0)$ ○ B: $(0, \pm\sqrt{5})$

○ C: $(0, \pm\sqrt{13})$ ○ D: $(\pm\sqrt{13}, 0)$

7. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x-a)$ is?

○ A: 90° ○ B: 60°

○ C: 45° ○ D: 30°

8. Equation of a line tangent to ellipse at $x^2/a^2 + y^2/b^2 = 1$ at points (4,10) is?

○ A: $4x/a^2 + 10y/b^2 = 1$ ○ B: $10x/a^2 + 4y/b^2 = 1$

○ C: $16x/a^2 + 100y/b^2 = 1$ ○ D: $100x/a^2 + 16y/b^2 = 1$

9. The line $y = 2x + c$ is tangent to the ellipse $x^2/16 + y^2/4 = 1$ if c equals?

○ A: $\sqrt{29}$ ○ B: $\sqrt{60}$

○ C: $\sqrt{68}$ ○ D: $\sqrt{74}$

10. What is the center of the ellipse $x^2 + 4y^2 + 4x - 24y + 24 = 0$?

○ A: (-2,3) ○ B: (-2, -3)

○ C: (2,3) ○ D: (2,-3)

11. Which of the following is not an equation of a circle?

○ A: $x^2 + y^2 - x + 98y + 11 = 4$ ○ B: $x^2 + y^2 + 18x + 98y + 11 = 0$

○ C: $5x^2 + 5y^2 + 14x + 12y - 10 = 0$ ○ D: $x^2 + 3y^2 + 10x - 9y + 11 = 0$

12. Latusrectum of the parabola $y^2 = -4ax$ is?

○ A: $x = a$ ○ B: $x = -a$

○ C: $y = a$ ○ D: $y = -a$

13. The equations $x = a \cos \theta$, $y = b \sin \theta$, $0 \leq \theta < 2\pi$, $a \neq b$, represents?

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

14. The vertex of the parabola $(y - a)^2 = 4a (x - a)$ is?

○ A: (0,a) ○ B: (a,0)

○ C: (0,0) ○ D: None of the above.

15. A second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola if?

○ A: $h^2 - ab = 0$ ○ B: $h^2 - ab > 0$

○ C: $h^2 - ab < 0$ ○ D: None of the above.

16. What is the length of the major axis for the ellipse $x^2/16 + y^2/4 = 1$?

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

17. The equation $y = mx + a/m$ is tangent to $y^2 = 4ax$ for m = ?

○ A: 0 ○ B: 1

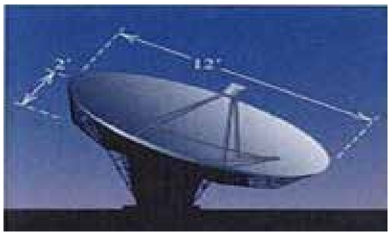
○ C: All positive values ○ D: All nonzero values

18. What is the center of a circle represented by a general form $5x^2 + 5y^2 + 24x + 36y + 10 = 0$?

○ A: (-12/5 , -18/5) ○ B: (12/5 , 18/5)

○ C: (-9/5 , -7/5) ○ D: (9/5 , 7/5)

19. **The interior of a satellite dish has diameter 12 ft and 2 ft deep as shown in the figure below. What is the distance from the center of the dish to the focus?**



○ A: 4.5 ft
○ B: 5.5 ft
○ C: 6.0 ft.
○ D: 6.2 ft

TEST 3

1. **Minimum number of non-collinear points on a circle required to form an equation of a circle are?**

○ A: 2
○ B: 3
○ C: 4
○ D: 5

2. **The foci of an ellipse are $(0, \pm 1)$ and minor axis is of unit length. The equation of the ellipse is ?**

○ A: $2x^2 + 4y^2 = 5$
○ B: $4x^2 + 2y^2 = 5$
○ C: $15x^2 + 6y^2 = 1$
○ D: $20x^2 + 4y^2 = 5$

3. **The sum of distances of any point on the ellipse $3x^2 + 4y^2 = 24$ from its foci is?**

○ A: 8 units
○ B: $2\sqrt{2}$ units
○ C: $4\sqrt{2}$ units
○ D: 7 units

4. **The line $y + 2x - 5 = 0$ with respect to the circle $x^2 + y^2 + 2x - 9 = 0$?**

○ A: Cuts the circle at two distinct points.
○ B: Tangent to the circle.
○ C: Do not touch the circle.
○ D: None of the above.

5. **If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then a is equal to?**

○ A: 15/16
○ B: 9/7
○ C: 5/4
○ D: 2/3

6. **What is the equation of tangent to the circle $x^2 + y^2 + 5/3\,x - 13/3\,y + 2/3 = 0$ at (1, 10/3)?**

○ A: $21x - 33y + 89 = 0$
○ B: $33x + 21y + 157 = 0$
○ C: $8x + 46y - 22 = 0$
○ D: $3x + 19y + 27 = 0$

7. **What is the equation of a circle with diameter between two points A (2,3) and B (4,6)?**

○ A: $x^2 + y^2 + 3x - 9y - 23 = 0$
○ B: $x^2 + y^2 - 9x - 2y + 11 = 0$
○ C: $x^2 + y^2 - 6x - 9y + 26 = 0$
○ D: Cannot be determined from the given information.

8. **If e_1 and e_2 are eccentricities of the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$ and $x^2/b^2 - y^2/a^2 = 1$ then?**

○ A: $e_1 = e_2$
○ B: $e_1 * e_2 = 1$
○ C: $e_1 + e_2 = 0$
○ D: $1/e_1^2 + 1/e_2^2 = 1$

9. **The line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$ if c equals?**

○ A: 2
○ B: 1/2
○ C: 0
○ D: -1/2

10. The equation of the circle whose diameter is the latusrectum of the parabola $x^2 = 4y$ is?

○ A: $x^2 + (y-1)^2 = 4$ ○ B: $(x-2)^2 + (y-1)^2 = 4$

○ C: $y^2 + (x-1)^2 = 4$ ○ D: $y^2 + (x-1)^2 = 2$

11. Line $y = 2c$ is a tangent to the parabola $y^2 = 4ax$ if c is equal to?

○ A: 0 ○ B: 4
○ C: 2a ○ D: None of the above.

12. The line $5y + 12x - 39 = 0$ to the circle $x^2 + y^2 = 9$?

○ A: Cuts the circle in two distinct points.

○ B: Do not touch the circle ○ C: Is tangent to circle

○ D: Cuts the circle at two imaginary points

13. What is the equation of a circle passing through non collinear points A(5, 8) and B(-2,9)?

○ A: $x^2 + y^2 + 4x - 12y - 20 = 0$ ○ B: $x^2 + y^2 + 4x - 9y - 15 = 0$

○ C: $x^2 + y^2 + 9x - 7y + 3 = 0$ ○ D: Equation cannot be formed from the given information.

14. What is the focus of the ellipse given by the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$?

○ A: $(1, \pm\sqrt{5})$ ○ B: $(1, -1\pm\sqrt{5})$

○ C: $(1, 1\pm\sqrt{5})$ ○ D: $(1\pm\sqrt{5}, -1)$

15. $x = \dfrac{e^t + e^{-t}}{2}$, $y = \dfrac{e^t - e^{-t}}{2}$; $t \in R$ represents

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

16. The line $y = mx + 1$ is tangent to parabola $y^2 = 4x$ if m = ?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

17. Slope of the normal at point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is?

○ A: 1/t ○ B: t

○ C: -t ○ D: -1/t

18. What is the equation of the asymptotes for the given hyperbola?

$4x^2 - 9y^2 - 32x - 18y + 19 = 0$.

○ A: $(y + 1) = \pm 2/3\ (x - 4)$ ○ B: $(y + 1) = \pm 4/9\ (x - 4)$

○ C: $(y - 1) = \pm 2/3\ (x + 4)$ ○ D: $(y - 1) = \pm 4/9\ (x + 4)$

19. The general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a hyperbola if?

○ A: $h^2 - ab < 0$ ○ B: $h^2 - ab = 0$

○ C: $h^2 - ab > 0$ ○ D: None of the above.

20. The point on the curve $y^2 = x$, where the tangent line makes an angle of 45° with the x-axis is?

○ A: (3/4,1/2) ○ B: (1/4,1/2)

○ C: (1/4,3/2) ○ D: (1,2)

TEST 4

1. **Parametric form of equation for a cricle is?**

○ A: $(a \sec \Theta, b \tan \Theta)$
○ B: $(r \cos \Theta, r \sin \Theta)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(at^2 , 2at)$

2. **What is the vertex of the parabola $y = -2x^2 + 4x + 1$?**

○ A: (2,1)
○ B: (-2,-1)
○ C: (-1,-3)
○ D: (1,3)

3. **If one foci of the ellipse is at (-3,0) and the ellipse is centered around the origin. What is the distance between the two foci of the ellipse?**

○ A: Cannot be determined.
○ B: 9
○ C: 6
○ D: 3

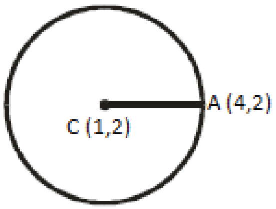
4. **What is the focus of the parabola $y^2 - x - 2y + 2 = 0$?**

○ A: (3/4 , 1)
○ B: (1/4 , 0)
○ C: (1/4 , 1)
○ D: (5/4 , 1)

5. **Axis of the parabola $9y^2 -16x -12y - 57 = 0$ is?**

○ A: 2/3
○ B: 3/2
○ C: -2/3
○ D: -3/2

6. **What is the equation of the circle given in the figure below?**



○ A: $(x - 1)^2 + (y - 2)^2 = 16$
○ B: $(x + 1)^2 + (y + 2)^2 = 9$
○ C: $(x - 1)^2 + (y - 2)^2 = 9$
○ D: $(x - 1)^2 + (y + 2)^2 = 16$

7. **Parametric form of equation for a parabola is?**

○ A: $(r \cos \Theta, r \sin \Theta)$
○ B: $(at^2 , 2at)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(a \sec \Theta, b \tan \Theta)$

8. **The equation of the parabola with focus at (0, a) and directrix $y + a = 0$ is $(a > 0)$?**

○ A: $x^2 = 4ay$
○ B: $x^2 = -4ay$
○ C: $y^2 = 4ax$
○ D: $y^2 = -4ax$

9. **The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is?**

○ A: (4,4)
○ B: (2,2)
○ C: $(\sqrt{2}, 2)$
○ D: $(2\sqrt{2}, 2)$

10. **For a general equation $Ax^2 + By^2 + Gx + Fy + C = 0$, if A is not equal to B and both have opposite signs then it represents?**

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

11. The line $y = mx + c$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ if?

○ A: $c = a/m$
○ B: $c^2 = a^2 m^2 + b^2$
○ C: $c^2 = a^2 m^2 - b^2$
○ D: None of the above.

12. If a is the major axis, b is the minor axis and e is the eccentricity of an ellipse. Its directrices are given by?

○ A: $\pm c/e$
○ B: $\pm b/e$
○ C: $\pm a/e$
○ D: $\pm b/e^2$

13. The equation $(y - y_1)(x_1 + g) = (x - x_1)(y_1 + f)$ represents?

○ A: Tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ B: Normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ C: Chord of a circle $x^2 + y^2 + 2gx + 2fy + c = 0$ through point (x_1 , y_1)
○ D: None of the above.

14. If the length of major axis of ellipse is 2a and length of minor axis is 2b. Then the length if latusrectum is approximately?

○ A: $4b/a$
○ B: $4a^2/b$
○ C: $2b^2/a$
○ D: $a/2b$

15. When the cutting of a conic section is perpendicular to the axis of the cone, it represents a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

16. What is the length of the tangent from point (-5, 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$?

○ A: $\sqrt{29}$
○ B: $\sqrt{67}$
○ C: $\sqrt{102}$
○ D: $\sqrt{133}$

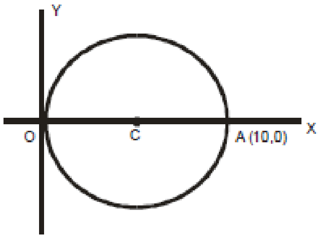
17. From a point P outside a circle, how many tangents can be drawn?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

18. What is the radius of a circle represented by the equation $x^2 + y^2+12x - 10y = 0$?

○ A: $\sqrt{61}$
○ B: $\sqrt{55}$
○ C: $\sqrt{52}$
○ D: $\sqrt{47}$

19. Equation of the circle given in the figure below is?



○ A: $x^2 + y^2 = 25$
○ B: $(x-5)^2 + y^2 = 25$
○ C: $(x + 5)^2 + y^2 = 25$
○ D: $(x + 5)^2 + y^2 = 10$

20. Find the equation of an ellipse with centre (0,0), focus (0,-3) and one vertes at (0,4)?

○ A: $x^2/16 + y^2/7 = 1$
○ B: $x^2/7 + y^2/16 = 1$
○ C: $x^2/\sqrt{7} + y^2/4 = 1$
○ D: $x^2/7 + y^2/4 = 1$

Vectors

TEST 1

1. **What are the direction cosines of unit vector**

$$\hat{\underline{v}} = \left[\frac{6}{\sqrt{41}}, \frac{-2}{\sqrt{41}}, \frac{1}{\sqrt{41}}\right]$$

○ A: 0, 0, 0
○ B: -6/√41 , +2/√41, -1/√41
○ C: 6/√41 , -2/√41, 1/√41
○ D: None of the above.

2. **If volume of a parallelepiped with a ,b , c as co-terminus edges is 36 the volume of the tetrahedron with the same edges is?**

○ A: 13
○ B: 12
○ C: 6
○ D: 3

3. **Value of [i, i , k] is?**

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

4. **The value of 2*i* x 4*k* =?**

○ A: 0
○ B: 8k
○ C: -8j
○ D: 8j

5. **The volume of the parallelepiped with *u* , *v* and *w* as its coterminus edges is?**

○ A: u.(v x w)
○ B: 1/2 * u.(v x w)
○ C: 1/6 * u.(v x w)
○ D: u x (v x w)

6. **If ā is a unit vector. Then the value of ā.ƃ is? Assume that the two vectos are not perpendicular to each other.**

○ A: 0
○ B: 1
○ C: ā cos θ
○ D: ƃ cos θ

7. **Which of the following statement is true?**

○ A: Only dot product possesses distributive property
○ B: Only cross product possesses distributive property
○ C: Both dot and cross product possess distributive property
○ D: Neither dot nor cross product possess distributive property

8. **The value of (2*j x i*) - 3*k* = ?**

○ A: -5k
○ B: 5k
○ C: k
○ D: -k

9. **Find the magnitude of vector v = -3i + 4j ?**

○ A: 2
○ B: 3
○ C: 4
○ D: 5

10. **If terminal point of a vector coincides with its origin point then it is called?**

○ A: Unit Vector.
○ B: Null Vector.
○ C: Equity Vector.
○ D: Negative Vector.

11. If ā = [1,-3] and б = [2,5] ; 4ā + 2б = ?

○ A: [3,2]
○ B: [8,2]
○ C: [-8,2]
○ D: [8,-2]

12. If ā, б and c are three vectors representing three edges of a parallelepiped. Its volume is given by?

○ A: ā x б x c
○ B: ā . б . c
○ C: ā . (б x c) / 2
○ D: ā . (б x c)

13. If three vectors are coplanar then their scalar triple product is?

○ A: 0
○ B: 1
○ C: -1
○ D: Equal to vector triple product.

14. i.j = ?

○ A: 0
○ B: 1
○ C: -1
○ D: k

15. If ā = i - k and б = j + k then the projection of ā along б is?

○ A: -1/√2
○ B: 1/√2
○ C: 1
○ D: -1

16. If k is a scalar ā x kб = ?

○ A: kā x б
○ B: k (ā x б)
○ C: kā x kб
○ D: Both A and B.

17. If ā = [2,1,3] and б = [-1,4,0]. What is the magnitude of ā - 2б?

○ A: 16
○ B: √74
○ C: √93
○ D: 36

18. What is the unit vector for v = 3i - j +2k?

○ A: [3/√14 , 1/√14, 2/√14]
○ B: [5/√37 , -2/√37, 7/√37]
○ C: [1/√37 , 8/√37, -3/√37]
○ D: [3/√14 , -1/√14, 2/√14]

19. The position vector of a point P(x, y, z) is denoted by?

○ A: $\overrightarrow{PQ}$
○ B: $\overrightarrow{P}$
○ C: $\overrightarrow{OP}$
○ D: All of the above.

20. k.k =?

○ A: 0
○ B: 1
○ C: -1
○ D: j

TEST 2

1. **If AB = i + j + k, AC = -4k and AD = i +2j - 8k then the volume of tetrahedron ABCD formed by the three vectors is?**

   ○ A: 1 ○ B: 2/3
   ○ C: 2 ○ D: 4

2. **What is the value of α such that αi + j , i + j + 3k and 2i + j - 2k are coplanar?**

   ○ A: 1/3 ○ B: 7/4
   ○ C: 9/5 ○ D: 8/5

3. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors such that $\left|\vec{b}\right| = \left|\vec{c}\right|$, then $\left[(\vec{a}+\vec{b}) \times (\vec{a}+\vec{c})\right] \times (\vec{b} \times \vec{c}) =$

   ○ A: 1 ○ B: -1
   ○ C: 0 ○ D: 2

4. **(2j x 3i).k = ?**

   ○ A: 0 ○ B: 7
   ○ C: 6 ○ D: -6

5. **What is the vector perpendicular to both vectors ā = 2i - j + k and b̄ = 4i + 2j - k?**

   ○ A: -i + 6j + 8k ○ B: -2i + 3j + 9k
   ○ C: 3i + 1j + 7k ○ D: 5i - 3j + k

6. **If ā = 2i - 4j + 5k and b̄ = 4i + xj - 4k. What is the value of x if ā and b̄ are perpendicular to each other?**

   ○ A: -1 ○ B: -2
   ○ C: -3 ○ D: -4

7. **Which of these vectors are parallel?**

   a = 2i + 3j + k, b = 4i + 6j + 2k, c = 6i + 9j + 3k

   ○ A: a and b ○ B: a and c
   ○ C: a, b and c all are parallel to each other.
   ○ D: None of them is parallel.

8. **Unit vector perpendicular to i - j and i + j is?**

   ○ A: k ○ B: -k
   ○ C: (i - j) / 2 ○ D: (i + j) / √2

9. **Which of the following expressions is meaningful?**

   ○ A: u.(v x w) ○ B: (u.v) .w
   ○ C: (u.v) . w ○ D: None of the above.

10. **Zero vector is?**

    ○ A: Parallel to every vector. ○ B: Perpendicular to every vector.
    ○ C: Both parallel and perpendicular to every vector.
    ○ D: Is inverse of every vector.

TEST 3

1. **The point which divides the line joining (2, 4, 5) and (-3, 5, - 4) in the ratio 2 : 3, lies on?**

○ A: XY plane ○ B: YZ plane

○ C: XZ plane ○ D: None of the above.

2. **If result of two forces ā of magnitude (P) and ƃ of magnitude (Q) isperpendicular to ā and has magnitude P. Then the magnitude of ƃ is?**

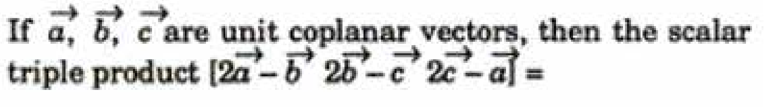
○ A: P ○ B: P√2

○ C: P√3 ○ D: 2P√3

3. **If ā x ƃ = ā x ē then which of the following is true?**

○ A: ā, ƃ and ē are coplanar. ○ B: ā, ƃ and ē are orthogonal

○ C: ƃ = ē ○ D: ā is parallel to ƃ

4. 

If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}\ \ 2\vec{b}-\vec{c}\ \ 2\vec{c}-\vec{a}] =$

○ A: 0 ○ B: 1

○ C: √2 ○ D: √3

5. **If ā, ƃ, ē, ō are the vertices of a square then?**

○ A: ƃ - ā = ē – ƃ ○ B: ā + ƃ + ē = 0

○ C: (ē - ā) . (ō - ƃ) = 0 ○ D: None of the above.

6. **If the vectors a, b and c be the vectors representing the sides AB, BC and CA respectively of a triangle ABC, then?**

○ A: a.(bxc) = 0 ○ B: (a.b) x c = (a.c) x b

○ C: |a x b| = |a x c| = |b x c| ○ D: |a x b| + |b x c| + |c x a| = 0

Position vector a = 2i - 3j and b = 3i + 2j. What are the coordinates of position vector that divides the line between a and b in ration 4:3?

○ A: 11/7 i + 8/7 j ○ B: 1/7 i - 5/7 j

○ C: 18/7 i - 1/7 j ○ D: 23/7 i + 3/7 j

7. **The points (5, 2, 4), (6, −1, 2) and (8, −7, k) are collinear if k is equal to?**

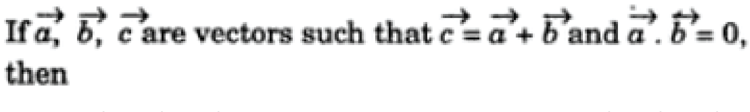
○ A: 3 ○ B: 2

○ C: -1 ○ D: -2

8. **If A (-2,-3), B (1,4), C(0,-5) are three vertices of parallelogram ABCD. What are the coordinates of D if AB is parallel to DC?**

○ A: (3,14) ○ B: (-4,11)

○ C: (-3, -12) ○ D: (-4, 9)

9. 

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{c} = \vec{a} + \vec{b}$ and $\vec{a} \cdot \vec{b} = 0$, then

○ A: $a^2 + b^2 + c^2 = 0$ ○ B: $a^2 - b^2 = c^2$

○ C: $a^2 + b^2 = 0$ ○ D: $c^2 = a^2 + b^2$

10. The point having position vectors $2\hat{i} + 3\hat{j} + 4\hat{k}$, $3\hat{i} + 4\hat{j} + 2\hat{k}$, $4\hat{i} + 2\hat{j} + 3\hat{k}$ are the vertices of a triangle. The triangle is?

○ A: Right angled. ○ B: Equilateral.
○ C: Isosceles. ○ D: None of the above.

11. The points with position vectors $14\hat{i} - 13\hat{j}$, $12\hat{i} - 5\hat{j}$ and $a\hat{i} + 11\hat{j}$ are collinear if a equals

○ A: 8 ○ B: 13
○ C: -5 ○ D: -9

12. **Angles α , β and δ are direction angles of a single vector only if?**

○ A: $\cos^2 \alpha = \cos^2 \beta = \cos^2 \delta$ ○ B: $\cos^2 \alpha = \cos^2 \beta + \cos^2 \delta$
○ C: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 0$ ○ D: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 1$

13. Let $\vec{a} = \hat{i} - \hat{k}$, $\vec{b} = x\hat{i} + \hat{j} + (1 - x)\hat{k}$ and $\vec{c} = y\hat{i} + x\hat{j} + (1 + x - y)\hat{k}$, then $[\vec{a}\ \vec{b}\ \vec{c}]$ depends on

○ A: Only x ○ B: Only y
○ C: Both x and y ○ D: Neither x nor y

TEST 4

1. **Unit vector in the direction of vector v = [-3,-4] is?**

○ A: -3/5 i - 4/5 j ○ B: -3/5 i + 4/5 j
○ C: 3/5 i - 4/5 j ○ D: 3/5 i + 4/5 j

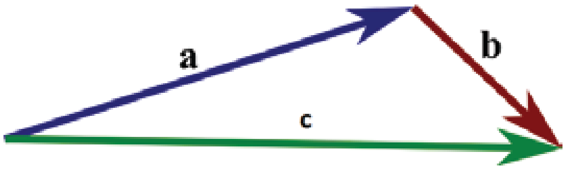
2. **Let a = 2i + j + k, a vector c perpendicular to a is?**

○ A: $\frac{1}{\sqrt{2}}(-j + k)$ ○ B: $\frac{1}{\sqrt{3}}(i + j - k)$
○ C: $\frac{1}{\sqrt{5}}(-i - j - k)$ ○ D: $\frac{1}{\sqrt{2}}(i - 2j)$

3. The area (in square units) of the parallelogram whose diagonals are $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} + 4\hat{k}$

○ A: √7 ○ B: √11
○ C: √14 ○ D: Cannot be determined from the given information.

4. **In the figure below vector b is given by?**



○ A: c + a ○ B: c - a
○ C: a – c ○ D: None of the above.

5. Let $\alpha = (x + 4y)\vec{a} + (2x + y + 1)\vec{b}$ and $\beta = (y - 2x + 2)\vec{a} + (2x - 3y - 1)\vec{b}$, where $\vec{a}$ and $\vec{b}$ are non-zero, non-collinear. If $3\alpha = 2\beta$, then

○ A: x= 1, y = -2 ○ B: x= -2, y = -1

○ C: x= 2, y = 2 ○ D: x= 2, y = -1

6. For two position vectors ā and ƃ. The coordinates of position vector dividing the line between ā and ƃ in ration 1 : 1 would be?

○ A: (ā - ƃ) / 2 ○ B: (ā + ƃ) / 2

○ C: (ā + ƃ) / 4 ○ D: (ā - ƃ) / 4

7. If magnitude of vector ā = 25 the ā.ā = ?

○ A: 5 ○ B: 25

○ C: 625 ○ D: 0

8. Which of the following is not a defined quantity?

○ A: i.i / k.k ○ B: i.j / j.j

○ C: i.i / i.k ○ D: All of them are defined quantities.

9. If ā.i = 0 and ā.j = 0 and ā.k = 0 then value of ā is?

○ A: i + j + k ○ B: [-1,-1,-1]

○ C: Unit vector. ○ D: Null vector.

10. A particle acted upon by forces $3\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}$ is displaced from a point P to a point Q whose respective position vectors are $2\hat{i} - \hat{j} - 3\hat{k}$ and $4\hat{i} - 3\hat{j} + 7\hat{k}$. The work done by the force is

○ A: 16 ○ B: 24

○ C: 36 ○ D: 38

11. Value of [k, i, j] is?

○ A: 0 ○ B: 1

○ C: -1 ○ D: √-1

12. Area of a parallelogram which has vectors i and i + j as the adjecent sides is?

○ A: ½ ○ B: 1

○ C: 2 ○ D: √2

13. If ā x ƃ = i + 2j + 2k then ƃ x ā= ?

○ A: 1/3i + 2/3j + 2/3k ○ B: -i - 2j - 2k

○ C: 2i + 2j + k ○ D: None of the above.

14. If ā = ƃ then the value of triple scalar product ā.(ƃ x c) is?

○ A: 0 ○ B: 1

○ C: -1 ○ D: ā.ƃ

15. Which of the following quantities is undefined?

○ A: (i.i) / (i x j) ○ B: (i.j) / (j.j)

○ C: (j x k) / (i x j) ○ D: (i x k) / (j x j)

16. Which of the following statement is true?

If a.b = 0 a and b are parallel, If a x b = 0 then either a or b must be zero,

If a. (b x c) = 0 then a, b and c are coplanar.

○ A: iii only ○ B: i and ii only

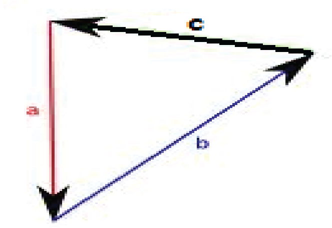
○ C: ii and iii only ○ D: i, ii and iii

17. If $u = 2\hat{i} - 4\hat{j} + 5\hat{k}$ and $v = 4\hat{i} - 3\hat{j} - 4\hat{k}$ then *u* and *v* are?

○ A: Parallel ○ B: Perpendicular

○ C: Equal ○ D: Opposite

18. Which of the following is true about the vector diagram given below?



○ A: c = a + b ○ B: c = a - b

○ C: a + b = 0 ○ D: a + b + c = 0

19. Which of the following position vectors have same magnitude?

a= [3,-4,2], b = [-3, 4, -2], c = [2, 4, 3]

○ A: a and b ○ B: a and c

○ C: All have same magnitude. ○ D: None of the has same magnitude.

20. In a parallelogram, the cross product of two adjacent vectors AB = i + 2j - 2j and BC = -2i + 2j + k is : 6i + 3j + 6k. The area of the parallelogram is?

○ A: 4.5 ○ B: 9

○ C: 15 ○ D: 18

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Number Systems

TEST 1

1. **i^{13} = ?**

○ A: 1 ○ B: -1

○ C: I ○ D: -i

2. **If -1 + $\sqrt{-3}$ = r $e^{i\Theta}$ then Θ equals to?**

○ A: 2 pi / 3 ○ B: -2 pi / 3

○ C: pi / 3 ○ D: - pi / 3

3. **Square roots of -1 are?**

○ A: i , -I ○ B: i

○ C: 1 ○ D: -i

4. $\left(\frac{2i}{1+i}\right)^2$ **is equal to?**

○ A: I ○ B: 2i

○ C: 1-I ○ D: 1-2i

5. **Conjugate of 4 + 5i is?**

○ A: -4 + 5i ○ B: 4 - 5i

○ C: $4^2 + (5i)^2$ ○ D: 5 + 4i

6. **$(1 + i)^2$ = ?**

○ A: 2i ○ B: -2i

○ C: I ○ D: -i

7. **The value of** $\frac{i^{4n+1} - i^{4n-1}}{2}$ **is equal to?**

○ A: 1 ○ B: -1

○ C: I ○ D: -i

8. **If y and g are two complex numbers then** $\overline{y+g} = ?$

○ A: $\bar{y} . \bar{g}$ ○ B: $\bar{y} / \bar{g}$

○ C: $\bar{y} + \bar{g}$ ○ D: $\bar{y} - \bar{g}$

9. **(3 + 2i) + (1 + i) = ?**

○ A: 4 + 2i ○ B: 4 + 3i

○ C: 4 - 2i ○ D: 4 - 3i

10. **The complex number i + $\sqrt{3}$ in polar form can be written as?**

○ A: $\frac{1}{\sqrt{2}}(sin \ \pi/6 + i \ cos \ \pi/6)$ ○ B: $2\,(cos \ \pi/6 + i \ sin \ \pi/6)$

○ C: $\frac{1}{2}(sin \ \pi/6 + i \ cos \ \pi/6)$ ○ D: $4\,(cos \ \pi/6 + i \ sin \ \pi/6)$

11. **If $g = 2 + i\sqrt{3}$ then $g.\bar{g}$ = ?**

○ A: $2 - i\sqrt{3}$
○ B: 13
○ C: 8
○ D: 7

12. **The moduli of complex number $1 - i\sqrt{3}$ = ?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

13. **4 * (1 - 3i) = ?**

○ A: 4 - 3i
○ B: 40
○ C: 4 - 12i
○ D: None of the above.

14. **Multiplicative identity for complex numbers is?**

○ A: (0 , 0)
○ B: (0 , 1)
○ C: (1 ,1)
○ D: (1 , 0)

15. **If z is a complex number then | z1 . z2 | = ?**

○ A: $\sqrt{(z1)^2 + (z2)^2}$
○ B: $\sqrt{(z1)^2 - (z2)^2}$
○ C: | z1 | x | z2 |
○ D: | z1 | / | z2 |

16. **(5, 0) * (2 , 0) = ?**

○ A: 10
○ B: 10 + i
○ C: 10 + 2i
○ D: 10 + 5i

17. **If z = 1 + i then multiplicative inverse of z^2 is?**

○ A: 1 – I
○ B: i / 2
○ C: - i / 2
○ D: 2i

18. **What is the product of (1 + i) and (1 + 2i)?**

○ A: -2 + I
○ B: 2 + i
○ C: -1 + 3i
○ D: 1 + 3i

19. **The value of | -5i | is?**

○ A: 5
○ B: 10
○ C: 20
○ D: 25

20. $\left(\frac{1-i}{1+i}\right)^{20}$ **is equal to?**

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: -1

TEST 2

1. The complex number (1 + 2i) / (1 - i) lies in?

○ A: I quadrant ○ B: II quadrant

○ C: III quadrant ○ D: IV quadrant.

2. A complex number added to its additive inverse would give?

○ A: Multiplicative identity ○ B: Additive identity

○ C: Additive inverse. ○ D: Multiplicative inverse.

3. If y is a complex number then | -y | = ?

○ A: | y | ○ B: $|\bar{y}|$

○ C: $|-\bar{y}|$ ○ D: All of the above.

4. If z is a complex number such that z + 1/z = 1 then the value of $z^{99} + 1/z^{99}$ is ?

○ A: 1 ○ B: -1

○ C: 2 ○ D: -2

5. Express in terms of i the sum of $\sqrt{-81}$ and $2\sqrt{-25}$.

○ A: 9i ○ B: -9i

○ C: 23i ○ D: 19i

6. Even integers (including zero) are closed under which of the following operation?

○ A: Addition ○ B: Subtraction

○ C: Multiplication ○ D: All of the above.

7. $\left[i^{67} + \frac{1}{i^{125}} \right] = ?$

○ A: 0 ○ B: 2

○ C: 2i ○ D: -2i

8. If $F = x^3 + x^2 + 2x + 6$ then F(i) = ?

○ A: 3 + I ○ B: 5 + i

○ C: 3 – I ○ D: 2 - 5i

9. Find multiplicative inverse of √2 - i√5 ?

○ A: -(√2 / 7) + (√5 / 7)I ○ B: (√2 / 7) - (√5 / 7)i

○ C: (√2 / 7) + (√5 / 7)I ○ D: -(√2 / 7) - (√5 / 7)i

10. Square roots of number $(-3)^2$ are?

○ A: 3i , -3i ○ B: 3

○ C: -3i ○ D: 3, -3

11. If y is a complex number then y . $\bar{y}$ = ?

○ A: $\bar{y}$ ○ B: y

○ C: $|-y|^2$ ○ D: None of the above.

12. The modulus of the complex number $\dfrac{(1-i\sqrt{3})(\cos\theta+i\sin\theta)}{2(1-i)(\cos\theta-i\sin\theta)}$ is

○ A: $1/\sqrt{2}$ ○ B: $1/2\sqrt{2}$

○ C: $1/\sqrt{3}$ ○ D: None of these.

13. $(\cos\Theta + i\sin\Theta)^n$ = ?

○ A: $(\cos\Theta^n + i\sin\Theta^n)$ ○ B: $\cos n\Theta - i\sin n\Theta$

○ C: $\cos n\Theta + i\sin n\Theta$ ○ D: $n\cos\Theta + i\,n\sin\Theta$

14. $i^5 + i^6$ = ?

○ A: 1 + I ○ B: -1 + i

○ C: i ○ D: 2I

15. $(-1)^{-21/2}$ = ?

○ A: 0 ○ B: 1

○ C: I ○ D: -i

16. Multiplicative inverse of the complex number 1 + i is?

○ A: 1 – I ○ B: 1/2 + 1/2i

○ C: 1/2 - 1/2i ○ D: $1/\sqrt{2} - i\,1/\sqrt{2}$

17. $\dfrac{2+i}{2-i} - \dfrac{2-i}{2+i} =$?

○ A: i / 5 ○ B: i / 3

○ C: 8i / 5 ○ D: 7i / 5

18. The conjugate complex of number $(2 - i) / (1 - 2i)^2$ is equal to?

○ A: 2 / 25 + i 11 / 25 ○ B: 2 / 25 - i 11 / 25

○ C: - 2 / 25 + i 11 / 25 ○ D: - 2 / 25 - i 11 / 25

19. If $8iz^3 + 12z^2 - 18z + 27i = 0$, then?

○ A: $|z| = 3/2$ ○ B: $|z| = 2/3$

○ C: $|z| = 1$ ○ D: $|z| = 1/3$

20. (8 , 9) * (5, -6) =?

○ A: (14, -1) ○ B: (94, -3)

○ C: (48, -2) ○ D: None of the above.

TEST 3

1. **The triangle formed by points 1 , (1 + i) / √2 and i in the argand diagram is?**

○ A: Scalene
○ B: Equilateral
○ C: Isoceles
○ D: Right angled

2. **The smallest integer n for which** $\left(\frac{1+i}{1-i}\right)^n = 1$ **is?**

○ A: 4
○ B: 8
○ C: 12
○ D: 16

3. $i^{88} - i^{22} = ?$

○ A: I
○ B: -i
○ C: 1
○ D: 2

4. **If** $a = |z_1| - |z_2|$; $b = |z_1 + z_2|$ **and** $c = |z_1| + |z_2|$ **then which of the following is true?**

○ A: $c \le b \le a$
○ B: $a \le c \le b$
○ C: $b \le a \le c$
○ D: None of the above.

5. **if** $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$**, then b is equal to ?**

○ A: √3
○ B: √2
○ C: 1
○ D: None of the above.

6. **Number of solutions for the equation** $z^2 + \bar{z} = 0$ **is?**

○ A: One
○ B: Two
○ C: Three
○ D: Four

7. If s and t are different integers and $\sqrt{st} = 8$, which of the following could *not* be a value of $s + t$?

○ A: 16
○ B: 20
○ C: 34
○ D: 65

8. **The modulus of** $\sqrt{2i} - \sqrt{-2i}$ **is?**

○ A: 2
○ B: √2
○ C: 0
○ D: 2√2

9. If x = $\sqrt{-1 - \sqrt{-1 - \sqrt{-1 - \sqrt{-1}}}}$ ... then x is equal to

○ A: w
○ B: w^2
○ C: w or w^2
○ D: 0

10. **The number of solutions for the equation** $z^2 + |z|^2 = 0$ **are? (z is a complex number)**

○ A: One
○ B: Two
○ C: Three
○ D: Infinite

11. The smallest positive number n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is?

○ A: 12
○ B: 8
○ C: 4
○ D: 2

12. For positive integers $(1 - i)^n \left(1 - \frac{1}{i}\right)^n$ equals to?

○ A: 0
○ B: $2i^n$
○ C: 2^n
○ D: 4^n

13. The complex numbers sin x + i cos 2x and cos x - i sin 2x are conjugate to each other for ?

○ A: x = n * pi
○ B: x = (n + 1/2) * pi
○ C: x = 0
○ D: No value of x.

14. Which of the following numbers lie on the imaginary axis of the Argand diagram?

○ A: 8 + 3i
○ B: 0 + 3i
○ C: 8 + 0i
○ D: None of the above.

15. Cube roots of unity?

○ A: Are collinear
○ B: Lie on the circle of radius √3
○ C: Form an equilateral triangle.
○ D: None of the above.

16. Which of the following is true about complex numbers?

○ A: They do not have a multiplicative inverse.
○ B: They don't have an additive inverse.
○ C: They always lie on the imaginary axis of the Argand diagram.
○ D: They don't satisfy the order of axioms.

17. Sum of three consecutive odd numbers is always divisible by?

○ A: 2
○ B: 3
○ C: 4
○ D: 6

18. $(a - ib)^3 = ?$

○ A: $a^3 - i(3a^2b - b^3)$
○ B: $a^3 - 3ab^2 - i(3a^3 - b^3)$
○ C: $a^3 + 3ab^2 - i(3a^2b - b^3)$
○ D: $a^3 - 3ab^2 - i(3a^2b - b^3)$

19. If $p^2 - 2pq + q^2 = c$ where p and q are positive integers and p is even and q is odd which of the following is true?

○ A: c is even and a perfect square.
○ B: c is odd and a perfect square.
○ C: c is even and not a perfect square.
○ D: c is odd and not a perfect square.

20. If $\left[\dfrac{(\sqrt{3}/2) + i\,(1/2)}{(\sqrt{3}/2) - i\,(1/2)}\right]^{120} = a + i\,b$, then

○ A: a = cos 20° and b = - sin 20°
○ B: a = cos 20° and b = sin 20°
○ C: a = 0 and b = 1
○ D: a = 1 and b = 0

TEST 4

1. $\left|(1+i)\left(\dfrac{2+i}{3+i}\right)\right|$ **is equal to?**

○ A: -1/2 ○ B: 1/2
○ C: 1 ○ D: -1

2. **The value of $(-i)^{1/3}$ is ?**

○ A: -I ○ B: i
○ C: 1 ○ D: None of the above.

3. **Which of the following is an irrational number?**

○ A: $\sqrt[3]{-8}$ ○ B: $\sqrt{\dfrac{32}{50}}$
○ C: $5 / \sqrt{5}$ ○ D: All of the above.

4. **If $(x + iy)(p + iq) = (x^2 + y^2)i$ then?**

○ A: $p = x, q = y$ ○ B: $p = x^2, q = y^2$
○ C: $q = x, p = y$ ○ D: None of the above.

5. If $\odot$ is an operation on positive real numbers, for which of the following definitions of $\odot$ is $r \odot s = s \odot r$ (commutative property)?

○ A: $r \Theta s = r - s$ ○ B: $r \Theta s = r / s$
○ C: $r \Theta s = r^2 s$ ○ D: $r \Theta s = (r + s) / (rs)$

6. **The complex number $1 + i\sqrt{3}$ in polar form is equal to?**

○ A: $2 \cos 60^\circ - i\, 2 \sin 60^\circ$ ○ B: $4 \cos 60^\circ + i\, 4 \sin 60^\circ$
○ C: $4 \cos 60^\circ - i\, 4 \sin 60^\circ$ ○ D: $2 \cos 60^\circ + i\, 2 \sin 60^\circ$

7. **(2 , 6) / (3 , 7) = ?**

○ A: (6/29 , -1/29) ○ B: (2/29 , -2/29)
○ C: (24/29 , 2/29) ○ D: (18/29 , 2/29)

8. $\dfrac{(1+i)^n}{(1-i)^{n-2}}$ **is equal to?**

○ A: $4i^{n-2}$ ○ B: $2i^{n-4}$
○ C: $2i^{n-1}$ ○ D: None of the above.

9. **If $z = \dfrac{\sqrt{3}+i}{2}$, then $(z^{101} + i^{103})^{105}$ is equal to**

○ A: I ○ B: -1
○ C: 0 ○ D: 1

10. Reciprocal of i is?

○ A: -1
○ B: 1
○ C: I
○ D: -i

11. $\frac{(1+i)^{2n+1}}{(1-i)^{2n-1}}$ **is equal to?**

○ A: 2 $(-1)^n$
○ B: 2i
○ C: -2
○ D: 2 + 2i

12. If Ȳ = y then y is?

○ A: Complex number
○ B: Real number
○ C: Ȳ is complex conjugate of y
○ D: None of the above.

13. The equation $|z - 1|^2 + |z + 1|^2 = 2$ **represents?**

○ A: A circle of radius 1
○ B: A circle of radius 2
○ C: Ordered pair (0, 0)
○ D: A straight line.

14. The number 4 + 3i lies on the ?

○ A: Imaginary axis of the Argand diagram.
○ B: Real axis of the Argand diagram.
○ C: Neither real nor imaginary axis of the Argand diagram.
○ D: None of the above.

15. Absolute value of complex number z = a + ib = ?

○ A: a + b
○ B: $a^2 + b^2$
○ C: $\sqrt{z.\tilde{z}}$
○ D: $z.\tilde{z}$

16. If $z = \left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^5$, then

○ A: Re (z) > 0
○ B: Re (z) > 0 and Im (z) > 0
○ C: Re (z) > 0 and Im (z) < 0
○ D: Im (z) = 0

17. $\sqrt{\frac{1}{-4}}$ **is equal to?**

○ A: i / 2
○ B: - i / 2
○ C: 2 I
○ D: -2 i

18. If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$ **then** α^{31} **is equal to?**

○ A: α
○ B: α^2
○ C: 0
○ D: 1

19. (a + bi) * (c + di) = ?

○ A: (ac - bd) + (ad + bc) I
○ B: (ac + bd) + (ad + bc) i
○ C: (ac - bd) + (ad - bc) I
○ D: (ac + bd) + (ad - bc) i

Sets & Functions

TEST 1

1. **If $A \cap B = \Phi$ then A and B are called?**

○ A: Complement of each other.
○ B: Null sets
○ C: Disjoint sets
○ D: Universal sets.

2. **Residue class modulo 5 for $4 + 3$ is?**

○ A: 2
○ B: 3
○ C: 5
○ D: 7

3. **$(A \cup B)' = ?$**

○ A: $A' \cup B'$
○ B: $A' \cap B'$
○ C: $A - B$
○ D: $(A - B)'$

4. **If $A = \{1,2,3\}$ and $B = \{2,3\}$, then $A \cup B = ?$**

○ A: $\{1\}$
○ B: $\{2,3\}$
○ C: $\{1,2\}$
○ D: $\{1,2,3\}$

5. **A set of all possible sub sets of a set is known as?**

○ A: Power set
○ B: Proper subset
○ C: Singleton Set
○ D: Universal set.

6. **$A \cap B = \Phi$ then $(A \cup B) = ?$**

○ A: $(A \cup B) = A + B$
○ B: $(A \cup B) = A + B - (A \cap B)$
○ C: $(A \cup B) = (A \cap B)$
○ D: Undefined.

7. **Set of all integers is not closed with respect to?**

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: Division

8. **Which of the following is a singleton set?**

○ A: $\{\ \}$
○ B: $\{0\}$
○ C: $\{5\}$
○ D: Both B and C.

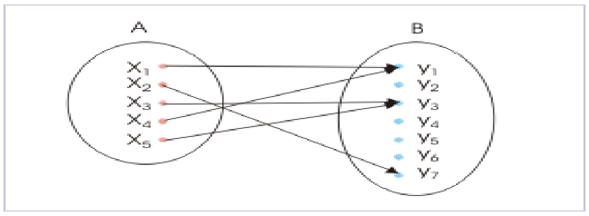
9. **Drawing conclusion from limited number of observations is called?**

○ A: Induction
○ B: Deduction
○ C: Logic
○ D: Proposition

10. **$Z = \{x \mid x = p/q$ where $p,q \in Z$ and $q \neq 0\}$ is a set of?**

○ A: Natural numbers
○ B: All integers
○ C: Irrational numbers
○ D: Rational numbers.

11. **The figure below shows what kind of function?**



○ A: Into function ○ B: (1-1) and into function

○ C: Onto function ○ D: (1-1) and onto function

12. **Which of the following relations is true?**

○ A: $0 \in \{ \}$ ○ B: $0 \in \{\Phi\}$

○ C: $0 \in \{0\}$ ○ D: None of the above.

13. **Which of the following is defined with respect to the universal set?**

○ A: Difference of two sets. ○ B: Intersetction of sets

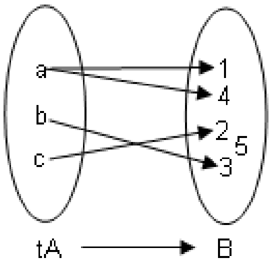
○ C: Union of sets ○ D: Complement of sets

14. **Aristotelian logic has how many possible outcomes?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

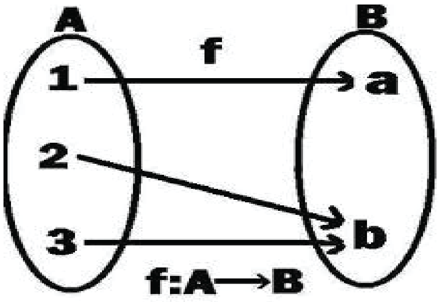
15. **The diagram below shows that?**



○ A: f is function from A to B ○ B: f is a one-one function from A to B

○ C: f is an onto function from A to B ○ D: f is not a function

16. **The figure below shows what kind of function?**



○ A: Into function ○ B: (1-1) and into function

○ C: Onto function ○ D: (1-1) and onto function.

17. The domain of the function $f = \{(1, 3), (3, 5), (2, 6)\}$ is?

○ A: 1, 3 and 2 ○ B: {1,3,2}

○ C: 3, 5 and 6 ○ D: {3,5,6}

18. Residue class modulo 7 for 9 + 5 is?

○ A: 14 ○ B: 7

○ C: 3 ○ D: 0

19. There are how many ways of describing a set?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

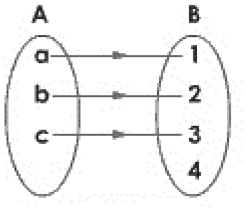
20. If A is a subset of B then A U B =?

○ A: A ○ B: B

○ C: A – B ○ D: B - A

TEST 2

1. The figure below shows what kind of function?



○ A: Into Function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

2. If $(x + 3, y - 2) = (7,5)$ then $(7x, 9y) = ?$

○ A: (3,-2)
○ B: (28,63)
○ C: (35,42)
○ D: (49,54)

3. If f = {(1, 4), (2, 5), (3, 6)} and g = {(4, 8), (5, 7), (6, 9)}, then (gof) is?

○ A: { }
○ B: {(1, 8), (2, 7), (3, 9)}
○ C: {(1, 7), (2, 8), (3, 9)}
○ D: None of the above.

4. Logical form of $(A \cup B)' = A' \cap B'$ is?

○ A: $\sim(p \vee q) = \sim p \wedge \sim q$
○ B: $\sim(p \wedge q) = \sim p \vee \sim q$
○ C: $(p \vee q) = p \wedge q$
○ D: $(p \vee q) \rightarrow \sim p \wedge \sim q$

5. If A and B are overlapping sets then A - B =?

○ A: A
○ B: B
○ C: $A - (A \cap B)$
○ D: $B - (A \cap B)$

6. To be classified as a group, the set must satisfy how many properties?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

7. Set of rational + irrational numbers is a set of?

○ A: All integers
○ B: All real numbers
○ C: Whole numbers
○ D: All of the above.

8. Let A = {1, 2, 3}. Then, the domain of the relation R = {(1, 1), (2, 3), (2, 1)} defined on A is?

○ A: {1,2}
○ B: {1,3}
○ C: {1,2,3}
○ D: None of the above.

9. All students who appear in GIKI entry test are pass, fail or put in the waiting list. If I appear in the GIKI entry test, I may pass, fail or be in the waiting list. This is an example of (choose the most appropriate answer)?

○ A: Induction
○ B: Deduction
○ C: Aristotelian logic
○ D: Non Aristotelian logic

10. A - B = Φ and A is not an empty then?

○ A: B = Φ ○ B: B - A = Φ

○ C: A is subset of B ○ D: B is subset of A.

11. If a set has 5 elements. Then number of elements in the power set would be?

○ A: 4 ○ B: 8

○ C: 16 ○ D: 32

12. Let A and B have 3 and 6 elements, respectively. What can be the minimum number of elements in A U B?

○ A: 3 ○ B: 6

○ C: 9 ○ D: Cannot determine.

13. If f : A → B be defined by f(x) = x + i, where i is a fixed integer and x set of integers, then f is?

○ A: Onto function ○ B: Into function

○ C: (1-1) and into function. ○ D: (1-1) and onto function.

14. If a set is closed with respect to an operation and the operation is associative then the set is called?

○ A: Semi group ○ B: Group

○ C: Monoid ○ D: Both A and C.

15. If A = {1, 2, 3} and B = {3, 4} and C = {4, 5, 6} then (A x B) ∩ (B x C) =?

○ A: {(1,4)} ○ B: {(3,4)}

○ C: {(1,4) , (3,4)} ○ D: {(2,4) , (1,3)}

16. The function f = {(1,2) , (1,3) , (1,4)} is a ?

○ A: Into function ○ B: Onto function

○ C: (1-1) onto function ○ D: None of the above.

17. Converse of $q \rightarrow p$ is?

○ A: $p \rightarrow q$ ○ B: $\sim p \rightarrow \sim q$

○ C: $\sim q \rightarrow \sim p$ ○ D: $\sim p \rightarrow q$

18. Set of all integers such that |x-3| < 2 is?

○ A: {1,2,3,4} ○ B: {1,2,3,4,5}

○ C: {2,3,4} ○ D: None of the above.

19. If A={1,2,3} , B = {1,2,3} and C = {3,2,1} which of the following is true?

○ A: A = B ○ B: C is inverse of A

○ C: A = B = C ○ D: Both A and B.

20. If A is a subset of B then A - B = ?

○ A: A ○ B: B

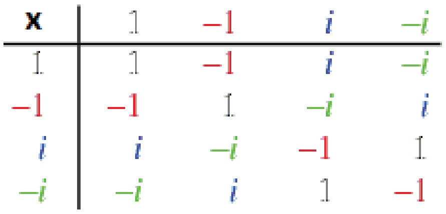
○ C: A - (A U B) ○ D: Φ

TEST 3

1. **In a town, 48% people are educated, 51% people are young, 60% are servicemen, 24% are educated and young, 25% are young and servicemen, 27% are educated and servicemen and 5% have all three characteristics. How many people (in percentage terms)do not have any of these three characteristics?**

○ A: 12%
○ B: 9%
○ C: 5%
○ D: 0%

2. **The table below shows multiplication operation on a set S = {1,-1,i,-i}. Which of the following is most accurate about the set w.r.t multiplication?**



x	1	−1	i	$-i$
1	1	−1	i	$-i$
−1	−1	1	$-i$	i
i	i	$-i$	−1	1
$-i$	$-i$	i	1	−1

○ A: It is a monoid
○ B: It is a group
○ C: It is an abelian group
○ D: It is a semi group

3. **In a zoo, there are 42 animals in the first sector, 34 in the second sector and 20 in the third sector. Out of these, 24 graze in sector one and also in sector two, 10 graze in sector two and sector three and 12 graze in sector one and sector three. These figures also include four animals grazing in all the three sectors. Find the total number of animals?**

○ A: 46
○ B: 50
○ C: 54
○ D: 60

4. **Let R be a relation in N defined by R = {(1+x , x^2) : x < 5 and x Є N}. Which of the following is false?**

○ A: Domain of R = {2,3,4,5}
○ B: Range of R = {4,9,16,25}
○ C: R = {(1,2) , (2,4) , (3,9) , (4,16) , (5,25)}
○ D: R = {(2,4) , (3,9) , (4,16) , (5,25)}

5. **For b Є N, bN = {bx : x Є N} then the first value of the set 6N ∩ 8N is?**

○ A: 8
○ B: 16
○ C: 24
○ D: 48

6. **Which of the following is a Singleton set?**

○ A: { x : |x|=5 , x Є N}
○ B: { x : |x|=15 , x Є Z}
○ C: { x : x^2 , x Є Z}
○ D: { x : 1 + x , x Є N}

7. **The set {x : x ≠ x} is?**

○ A: {0}
○ B: {Φ}
○ C: {1}
○ D: { }

8. **If N_a = {an : n Є N}, find the value of $N_6 \cap N_8$?**

○ A: N_6
○ B: N_8
○ C: N_{12}
○ D: N_{24}

9. **If n(A) = 115 , n(B) = 326 and n(A ∩ B) = 65. Then n(A U B) = ?**

○ A: 68
○ B: 73
○ C: 128
○ D: 376

10. Which of the following cannot have a proper subset?

○ A: { x : x Є N} ○ B: { x : x Є Q, 3 < x < 4}

○ C: { x : x Є N, 3 < x < 4} ○ D: { x : x Є Z, 3 < x < 6}

11. If the relation R : A → B, where A = {1, 2, 3} and B = {1, 3, 5} is defined by R = {(x, y) : x < y, x ∈ A, y ∈ B}, then

○ A: R = {(1,3) , (1,5) , (2,3) , (2,5) , (3,5)} ○ B: R = {(1,3) , (1,5) , (2,3) , (2,5) }

○ C: R^{-1} = {(3,1) , (5,1) , (3,2) , (5,2) , (3,3) } ○ D: R = {(1,1) , (1,3) , (1,5) , (2,3) , (2,5) }

12. Set of cube roots of unit w.r.t addition is?

○ A: Semi group ○ B: Group

○ C: Monoid ○ D: None of the above.

13. If X = {4^n – 3n – 1 : n Є N} and Y = {9 (n – 1) : n Є N}, find the value of X U Y?

○ A: X ○ B: Y

○ C: N ○ D: None of the above.

14. Let R by a relation in N defined by R = {(x,y) : x + 2y = 8}. The range of R is?

○ A: {2,4,6} ○ B: {1,2,3}

○ C: {2,4,6,8} ○ D: {1,2,3,4,5,6}

15. What are the missing entries in the conditional table below? (From top to bottom)

p	**q**	$p \to q$
T	T	?
T	F	?
F	T	?
F	F	?

○ A: T, F, F, T ○ B: T, T, T, F

○ C: T, F, T, F ○ D: T, F, T, T

16. The number of relations that can be defined on the set A = {a, b, c, d} is?

○ A: 16 ○ B: 24

○ C: 4^4 ○ D: 2^{16}

17. If n(A) = 115 , n(B) = 326 and n(A-B) = 47, then n(A ∩ B) = ?

○ A: 373 ○ B: 158

○ C: 68 ○ D: 44

18. Which of the following is an empty set?

○ A: { x : x Є R and $x^2 - 3 = 0$} ○ B: { x : x Є R and $x^2 + 3 = 0$}

○ C: { x : x Є R and x + 11 = 0} ○ D: { x : x Є R and $x^4 - 3 = 0$}

19. If for two sets A and B we have (A U B) = (A ∩ B) = B, then we have?

○ A: B = Φ and A ≠ Φ ○ B: A - B = Φ

○ C: B - A = Φ ○ D: A = B

20. The set of fourth roots of unity are closed with respect to?

○ A: Addition
○ B: Division
○ C: Subtraction
○ D: None of the above.

TEST 4

1. The inverse of function {(1,2) , (2,3) , (3,4)} is?

○ A: {(1,2) , (2,3) , (3,4)}
○ B: {(1,1/2) , (1/2,1/3) , (1/3,1/4)}
○ C: {(2,1) , (3,2) , (4,3)}
○ D: {(-1,-2) , (-2,-3) , (-3,-4)}

2. 46 in binary is?

○ A: 100110
○ B: 101111
○ C: 101110
○ D: 101010

3. In a town with a population of 5000, the number of people who are egg eaters is 3200. If 2500 are meat eaters and 1500 eat both egg and meat. How many of them eat neither meat nor egg?

○ A: 4200
○ B: 1500
○ C: 800
○ D: 500

4. If A = {1,2,3,4} then {(x,y) | x+y < 5} is a ?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function `
○ D: Not a function.

5. If A and B are disjoint sets then A - B = ?

○ A: A
○ B: B
○ C: B – A
○ D: Both A and C.

6. A group is called abelian group if?

○ A: It is closed
○ B: It satisfies associativity
○ C: It has inverse as part of the group.
○ D: It satisfied commutativity.

7. Let A = {a, b, c}. Then, the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is?

○ A: {a, b, c}
○ B: {a, b}
○ C: {a}
○ D: {b,c}

8. Contrapositive of $p \rightarrow q$ is?

○ A: $q \rightarrow p$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

9. X = {0,1,2,3,4 .....} is a set of?

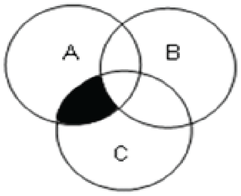
○ A: Natural numbers
○ B: Whole numbers
○ C: All integers
○ D: All of the above.

10. All Irish people drink beer. If someone is Irish he would definitely drink beer. The logic is an example of?

○ A: Proposition
○ B: Induction
○ C: Deduction
○ D: Logic analysis

The shaded area in this diagram represents

11.



○ A: A ∩ C

○ B: (A ∩ B) – C

○ C: (A – C) ∩ (A – B)

○ D: (A ∩ C) – B

12. Set of natural numbers is closed with respect to?

Addition, Multiplication, Subtraction

○ A: i only

○ B: ii only

○ C: i and ii only

○ D: i, ii and iii

13. If a function f: A→B is such that Ran f = B then f is a/an ?

○ A: Into function

○ B: Onto function

○ C: (1 – 1) and onto

○ D: Both B and C.

14. A, B and C are three sets such that A ∪ B = A ∪ C and A ∩ B = A ∩ C. Which of the following conditions is true according to the given statement?

○ A: A = B

○ B: B = C

○ C: A = C

○ D: A = B = C

15. The set of cube roots of unit is closed with respect to?

○ A: Multiplication

○ B: Addition

○ C: Subtraction

○ D: None of the above.

16. If set A = {1,w,w^2} is an abelian group then inverse of w is?

○ A: 1

○ B: w

○ C: w^2

○ D: Abelian group does not have an inverse.

17. The range of the function f(x) = |x - 1| is? Where domain is the set of all integers.

○ A: (- ∞, ∞)

○ B: (0, ∞)

○ C: [0, ∞)

○ D: (- ∞, 0)

18. Which of the following is true about the null set?

It is the subset of every set. Number of elements in its power set is zero. It contains no elements

○ A: iii only

○ B: i and iii only

○ C: ii and iii only

○ D: i, ii and iii.

19. Z = {x | x ≠ p/q where p,q Є Z and q ≠ 0} is a set of?

○ A: Natural numbers

○ B: All integers

○ C: Irrational numbers

○ D: Rational numbers.

20. If A ∩ B ≠ Φ then (A U B) = ?

○ A: A + B

○ B: (A U B) = A + B - (A ∩ B)

○ C: (A U B) = A + B + (A ∩ B)

○ D: Φ

Matrices & Determinations

TEST 1

1. **Inverse of the matrix $\begin{bmatrix}1 & -2\\ 3 & 4\end{bmatrix}$ is?**

   ○ A: $10\begin{bmatrix}4 & -2\\ 3 & 1\end{bmatrix}$ ○ B: $\frac{1}{10}\begin{bmatrix}4 & -2\\ 3 & 1\end{bmatrix}$

   ○ C: $\frac{1}{10}\begin{bmatrix}4 & 2\\ -3 & 1\end{bmatrix}$ ○ D: $10\begin{bmatrix}4 & 2\\ -3 & 1\end{bmatrix}$

2. **The matrix below has order of?**

   $\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix}$

   ○ A: 6 x 1 ○ B: 2 x 3

   ○ C: 3 x 2 ○ D: 2 x 2

3. **If *A* and *B* are matrices, then which from the following is true ?**

   ○ A: $A + B \neq B + A$ ○ B: $(A^t)^t \neq A$

   ○ C: $AB \neq BA$ ○ D: All are true.

4. **A squar matrix is one in which?**

   ○ A: $n = m^2$ ○ B: $n^2 = m$

   ○ C: n = m ○ D: All numbers are squares of integers.

5. **The number of non-zero rows in an echlon form is called ?**

   ○ A: reduced echlon form ○ B: rank of the matrix

   ○ C: conjugate of the matrix ○ D: co-factor of the matrix

6. **M_{12} the matrix given below is?**

   $\begin{vmatrix}2 & 1 & 1\\ 1 & 2 & 1\\ 1 & 1 & 2\end{vmatrix}$

   ○ A: $\begin{vmatrix}2 & 1\\ 1 & 2\end{vmatrix}$ ○ B: $\begin{vmatrix}1 & 1\\ 1 & 2\end{vmatrix}$

   ○ C: $\begin{vmatrix}2 & 1\\ 1 & 1\end{vmatrix}$ ○ D: $\begin{vmatrix}1 & 2\\ 1 & 1\end{vmatrix}$

7. **The matrix given below is a?**

   $\begin{bmatrix}1 & 3 & 2\\ 3 & 0 & 1\\ 2 & 1 & 5\end{bmatrix}$

   ○ A: Symmetric. ○ B: Skew Symmetric

   ○ C: Hermitian ○ D: Skew Hermitian

8. What is the order of the matrix given below?

$$\begin{bmatrix}1 & 2\\3 & 4\\5 & 6\end{bmatrix}$$

○ A: 6 x 1

○ B: 2 x 3

○ C: 3 x 2

○ D: 2 x 2

9. Determinant of singular matrix is ?

○ A: 1

○ B: positive

○ C: negative

○ D: 0

10. If the system of equations $x - Ky - z = 0$, $Kx - y - z = 0$, $x + y - z = 0$ has a non-zero solution, then the possible values of K are?

○ A: -1, 2

○ B: 1, 2

○ C: 0, 1

○ D: -1, 1

11. The following matrix is?

$$\begin{bmatrix}1 & 2 & 3\\0 & 4 & 5\\0 & 0 & 6\end{bmatrix}$$

○ A: Non singular

○ B: Unit matrix

○ C: Lower triangle.

○ D: Upper Triangle.

12. Value of $\begin{vmatrix}w & 1 & w\\w & 2 & w\\w & 3 & w\end{vmatrix}$ **is?**

○ A: w

○ B: 0

○ C: 1

○ D: 2

13. If A = $\begin{bmatrix}2 & 5\\5 & 2\end{bmatrix}$**, then $A^3 - 4A^2$ is equal to**

○ A: $\begin{bmatrix}42 & 105\\-105 & 42\end{bmatrix}$

○ B: $\begin{bmatrix}42 & 105\\105 & 42\end{bmatrix}$

○ C: $\begin{bmatrix}105 & 42\\105 & 42\end{bmatrix}$

○ D: None of the above.

14. A determinant remains same if :

○ A: Every element in a column is multiplied by the same factor

○ B: Two columns are interchanged.

○ C: Two rows are interchanged.

○ D: Each element of any row is added to the corresponding element of any other row multiplied by given factor

15. For matrices $(AB)^t$ = ?

○ A: A^tB^t

○ B: AB

○ C: B^tA^t

○ D: BA

16. If A = $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A|$ is?

○ A: 2
○ B: 3
○ C: 4
○ D: 5

17. If AB = A then, B is a?

○ A: Unity Matrixq
○ B: Identity Matrix
○ C: Inverse of A
○ D: Both A & B.

18. If the order of matrix *A* is *m* x *p*. And the order of *B* is *p* x *n*. Then the order of *AB* is ?

○ A: m x p
○ B: p x n
○ C: m x n
○ D: n x m

19. For matrices A^{-1} = ?

○ A: $Adj\ A\ \ |A|$
○ B: $|A|\ \frac{1}{Adj\, A}$
○ C: $\frac{1}{|A|\ A} Adj\ A$
○ D: $\frac{1}{|A|} Adj\ A$

TEST 2

1. Inverse for the matrix $a = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is?

○ A: $\frac{1}{ad - bc} \begin{bmatrix} d & b \\ c & a \end{bmatrix}$
○ B: $\frac{1}{ab - cd} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
○ C: $\frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
○ D: $\frac{1}{ad - bc} \begin{bmatrix} -d & -b \\ -c & -a \end{bmatrix}$

2. For matrices if AX = B then which of the following conditions holds?

○ A: $X = A^{-1}B$
○ B: $A^{-1}(AX) = BA^{-1}$
○ C: $X = BA^{-1}$
○ D: All of the above.

3. For matrices, if AX=B then X = ?

○ A: B / |A|
○ B: $\frac{1}{|A|} * adj(A.B)$
○ C: $B.(\frac{1}{|A|} adjA)$
○ D: $(\frac{1}{|A|} * adjA).B$

4. Fine the cofactor A_{23} for the matrix $\begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix}$

○ A: 7
○ B: 0
○ C: 23
○ D: -7

5. The matrix $B = \begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$ **can be defined as?**

○ A: Symmetric `○ B: Skew Symmetric

○ C: Triangular ○ D: Hermitian

6. Find the cofactor A_{22} for the $\begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

○ A: 8 ○ B: -7

○ C: -10 ○ D: 3

7. If A is a square matrix, then A^{-1} does not exist if

○ A: |A|>0 ○ B: |A|<0

○ C: |A|=0 ○ D: A≠0

8. Value of determinance is?

○ A: 0 ○ B: 1

○ C: x+y+z+w ○ D: xyzw

If

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

9. then order of matrix A = ?

○ A: 3 x 2 ○ B: 2 x 3

○ C: 3 x 3 ○ D: 2 x 2

10. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

○ A: 8 ○ B: -8

○ C: 400 ○ D: 0

11. If I is an identity matrix, then?

○ A: $I^n=0$ ○ B: $I^n=I$

○ C: 2I=0 ○ D: None of these.

12. If x, y and z are non zero numbers. The inverse of matrix $\begin{bmatrix} x & y \\ z & 1 \end{bmatrix}$ **is?**

○ A: $\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$ ○ B: $\frac{1}{x-yz}\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & -y \\ -z & -x \end{bmatrix}$ ○ D: None of these.

13. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then?

○ A: $\alpha = a^2 + b^2, \beta = -2ab$

○ B: $\alpha = a^2 + b^2, \beta = ab$

○ C: $\alpha = a^2 - b^2, \beta = 2ab$

○ D: $\alpha = a^2 + b^2, \beta = 2ab$

14. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 23 \\ 0 & -10 \end{bmatrix}$ then |AB| is?

○ A: 80

○ B: 100

○ C: -110

○ D: 90

15. The number of non-zero rows when a matrix is reduced to echelon matrix form is known as?

○ A: Rank of the matrix.

○ B: Degree of matrix.

○ C: Skew echelon of matrix.

○ D: None of the above.

16. If augmented matrix of a system is of form $\begin{bmatrix} 1 & 0 & : & 5 \\ 0 & 1 & : & -3 \end{bmatrix}$ Solution to the equations of the system is?

○ A: 1 and 0

○ B: 0 and 1

○ C: 5 and -3

○ D: None of the above.

17. The value of the determinant given below is equal to

$$\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$$

○ A: 6 xyz

○ B: xyz

○ C: 4 xyz

○ D: xy + yz +zx

18. If a matrix A is multiplid with a number k then the determinant of resulting matrix is?

○ A: k |A|

○ B: 1/k |A|

○ C: k^2|A|

○ D: |A|

19. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

○ A: -3, 1

○ B: -1, 3

○ C: 3, 1

○ D: -3, -1

20. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ then A^2= ?

○ A: $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$

○ B: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

○ D: $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

TEST 3

1. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

○ A: [2, 4]   ○ B: [0, 4]

○ C: [1, 4]   ○ D: None of these.

2. **If A and B are symmetric matrices, then AB + BA is a?**

○ A: Symmetric matrix   ○ B: Skew symmetric matrix

○ C: Diagonal matrix   ○ D: Triangular matrix

3. **Which of the following is an Echelon form of a matrix?**

○ A: $\begin{bmatrix} 0 & 1 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ ○ B: $\begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 0 & 2 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 8 \end{bmatrix}$ ○ D: Both A & B.

4. **1, 2, 3, 4 are four numbers. If a matrix of order m x n is formed by using all the four numbers, then how many set of values (m, n) are possible?**

○ A: 1   ○ B: 2

○ C: 3   ○ D: 4

5. If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

○ A: $\begin{bmatrix} 13 & 4 \\ 8 & 5 \end{bmatrix}$ ○ B: $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$ ○ D: $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

6. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x, y not equal to zero, then D is

○ A: Divisible by neither x nor y.   ○ B: Divisible by both x and y

○ C: Divisible by x but not y   ○ D: Divisible by y but not x

7. $\begin{vmatrix} a+x & b & c \\ a & b+y & c \\ a & b & c+z \end{vmatrix}$ is equal to

○ A: $xyz\,(1 + a/x + b/y + c/z)$ ○ B: $xyz\,(1 + x/a + y/b + z/c)$

○ C: $xyz\,(1 + x + y + z)$ ○ D: $xyz\,(1 + a + b + c)$

Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$

8. If $|A|^2 = 25$, then $|\alpha|$ is equal to

○ A: 1/5q
○ B: 5
○ C: 1
○ D: 25

9. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ such that $A + A^C = I$, then value of α is

○ A: $\pi/6$
○ B: $\pi/3$
○ C: π
○ D: 0

10. Which is the following is the condition for a Skew Hermitian matrix?

○ A: $(\bar{A})^t = A$
○ B: $(\bar{A})^t = A^2$
○ C: $(\bar{A})^t = -A$
○ D: $\bar{A}^t = -A^2$

11. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$, where $a = i$, $b = \omega$, $c = \omega^2$, then Δ is equal to

○ A: I
○ B: -1
○ C: 1
○ D: -i

12. If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$, then f(100) is equal to

○ A: 0
○ B: 1
○ C: 100
○ D: -100

13. The solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$ is

○ A: 1, 2, 3
○ B: 1, 2, -3
○ C: -1, 2, 3
○ D: -1, -2, 3

14. Which of the following is true for Echelon Form of a Matrix?

○ A: In any row, the number of zeros before the leading entry is greater than the number of such zeros in the preceding row.

○ B: All non zero rows preceeds row including zeros.

○ C: First entry in any non zero row is 1.

○ D: All of the above.

15. The matrix $A = \begin{bmatrix} 1 & 1-i \\ 1+i & 2 \end{bmatrix}$ is a?

○ A: Symmetric Matrix
○ B: Hermitian Matrix
○ C: Skew symmetric matrix
○ D: Skew hermitian matrix

16. The value of the determinate $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

○ A: $5\sqrt{3}(-\sqrt{6}-5)$ ○ B: $5\sqrt{3}(\sqrt{6}-5)$

○ C: $5\sqrt{3}(5-\sqrt{6})$ ○ D: $\sqrt{3}(\sqrt{6}-5)$

17. If A and B are symmetric matrices, then AB would equal to?

○ A: -BA ○ B: BA

○ C: 0 ○ D: I

18. In reduced echelon form of the matrix if first non zero entry of a row lies in Column j, all other entries in the column are?

○ A: Positive ○ B: Negative

○ C: Zero ○ D: None of the above.

TEST 4

1. For the matrix below find the |A|?

$$A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

○ A: 30 ○ B: 40

○ C: 50 ○ D: 60

2. A triangular matrix is always a?

○ A: Echelon form of Matrix. ○ B: Reduced Echelon form of Matrix.

○ C: Square matrix. ○ D: Non of the above.

3. What is the conjugate of matrix $A = \begin{bmatrix} i & 10+i \\ -2i & 1-i \end{bmatrix}$

○ A: $\begin{bmatrix} -i & 10+i \\ -2i & 1+i \end{bmatrix}$ ○ B: $\begin{bmatrix} i & 10-i \\ 2i & 1-i \end{bmatrix}$

○ C: $\begin{bmatrix} -1 & 10-i \\ 2 & 1+i \end{bmatrix}$ ○ D: $\begin{bmatrix} -i & 10-i \\ 2i & 1+i \end{bmatrix}$

4. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

○ A: $\alpha=1$ ○ B: $\alpha=0$

○ C: $\alpha=-1$ ○ D: None of these.

5. The matrix A = $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ can be described as?

○ A: Hermitian

○ B: Skew Hermitian

○ C: Symmetric

○ D: Skey Symmetric.

For a system of equations,

$x + 3y + 2z = 3$

$4x + 5y - 3z = -3$

$3x - 2y + 17z = 42$

6. Fine the values of x, y and z if the echelon form of matrix is $\begin{bmatrix} 1 & 3 & 2 & :3 \\ 0 & 1 & -1 & :-3 \\ 0 & 0 & 1 & :2 \end{bmatrix}$

○ A: x = 2 ; y = -1; z = 2

○ B: x = -2 ; y= 1; z= 2

○ C: x = 4 ; y = -1; z = 2

○ D: x= 2 ; y =-2; z = 2

7. Find the value of a if the following matrix is singular $\begin{bmatrix} -4 & 2 \\ -6 & a \end{bmatrix}$

○ A: -3

○ B: 3

○ C: 5

○ D: -5

8. If A=$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A is symmetric then?

○ A: x=0, y=5

○ B: x+y=5

○ C: x=y

○ D: None of the above.

9. Let $A = \begin{vmatrix} 1 & bc & a(b+c)) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b)) \end{vmatrix}$**. Value of A is equal to?**

○ A: ab + bc +ca

○ B: a + b + c

○ C: $(a + b + c)^2$

○ D: None of the above

10. If in a square matrix A two rows or two columns are interchanged the determinant of the resulting matrix is?

○ A: A^{-1}

○ B: -|A|

○ C: |A|

○ D: None of the above.

11. What is the rank of the matrix $A = \begin{bmatrix} 1 & 0 & 7 & -2 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

○ A: 1

○ B: 2

○ C: 3

○ D: 4

12. **What is value of the determinant** $A = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{vmatrix}$

○ A: 25　　○ B: -25

○ C: 30　　○ D: -30

13. **If ω is the cube root of unity then the value of is ?**

○ A: $a^3 + b^3 + c^3$　　○ B: ab - bc

○ C: 0　　○ D: $a^3 + b^3 + c^3$ -3abc

14. **If x + ay = 0; y + az = 0; z + ax = 0, then the value of ‘a’ for which the system of equations will have infinite number of solutions is?**

○ A: 1　　○ B: 0

○ C: -1　　○ D: None of these.

Quadratic Equations

TEST 1

1. **Find the value of x where $9x^2 - 12x - 5 = 0$.**

   ○ A: -1/3 , 5/3 ○ B: -2/3 , 5/3

   ○ C: -1/3, 2/3 ○ D: 2/3 , 5/3

2. **$\omega^{-12} = ?$**

   ○ A: ω ○ B: ω^2

   ○ C: 1 ○ D: 0

3. **If x-a is a factor of f(x) then f(a) = ?**

   ○ A: a ○ B: 0

   ○ C: 1 ○ D: w

4. **Solution to the equation $6x^2 + x - 15 = 0$ is?**

   ○ A: 3/2 , -3/2 ○ B: 6/7 , -4/5

   ○ C: 3/2 , -5/3 ○ D: None of the above.

5. **Roots of the equation $2x^2 + 5x - 1$ are?**

   ○ A: Complex ○ B: Irrational

   ○ C: Equal ○ D: Rational

6. **The condition for polynomial equation $ax^2 + bx + c = 0$ to be quadratic is?**

   ○ A: $a > 0$ ○ B: $a < 0$

   ○ C: $a \neq 0$ ○ D: $a \neq 0$ and $b \neq 0$

7. *If the product of the roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, the value of m is?*

   ○ A: 1 ○ B: -1

   ○ C: 1/3 ○ D: -1/3

8. **Quadratic equations are?**

   ○ A: First degree polynomials. ○ B: Second degree polynomials.

   ○ C: Third degree polynomials. ○ D: Fourth degree polynomials.

9. **$1 + \omega + \omega^2 = ?$**

   ○ A: 1 ○ B: ω

   ○ C: ω^2 ○ D: 0

10. **For quadratic equation $ax^2 + bx + c = 0$, Sum of roots is equal to?**

    ○ A: b/a ○ B: -b/a

    ○ C: c/a ○ D: -c/a

11. **If S and P are the sum and products of the roots of the quadratic equation, then the equation may be written as?**

    ○ A: $x^2 + Sx + P = 0$ ○ B: $x^2 - Sx - P = 0$

    ○ C: $x^2 - Sx + P = 0$ ○ D: $x^2 + Sx - P = 0$

12. Roots of the equation $x^2 + 7x + 12$ are?

○ A: 3, 4 ○ B: -3, 4

○ C: 3, -4 ○ D: -3, -4

13. Sum of all fourth roots of unit is?

○ A: 1 ○ B: -1

○ C: 0 ○ D: i

14. Product of all fourth roots of unity are?

○ A: 1 ○ B: -1

○ C: 0 ○ D: i

15. $\frac{-1+\sqrt{3}i}{2} * \frac{-1-\sqrt{3}i}{2}$ **= ?**

○ A: $\frac{-1+\sqrt{3}i}{2}$ ○ B: $\frac{-1-\sqrt{3}i}{2}$

○ C: 1 ○ D: 0

16. The solution for equation $x^2 - x = 2$ is?

○ A: 1 , -2 ○ B: -1, 4

○ C: 2, -1 ○ D: 2, -3

TEST 2

1. The degree of the equation $x^4 + 1/ x^4 - 3 = 0$ is?

○ A: 4 ○ B: 6

○ C: 8 ○ D: None of the above.

2. $x + 2$ is a factor of ?

○ A: $x^4 + 2$ ○ B: $x^4 -x^2 + 12$

○ C: $x^4 - 2x^3 - x + 2$ ○ D: $x^4 + 2x^3 - x – 2$

3. If the equation $x^3 + 4x^2 -2x + 5$ is divided by x-1 the remainder is?

○ A: 10 ○ B: 9

○ C: 8 ○ D: 7

4. $\omega^{-5} = ?$

○ A: ω ○ B: ω^2

○ C: 1 ○ D: None of the above.

5. The equation $\sqrt{x+3} + \sqrt{x+5} = \sqrt{3x+2}$ is called?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal equation ○ D: Square root equation.

6. The equation $2^{2x} + 4^x - 10 = 0$ is?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal ○ D: None of the above.

7. Out of the three cube roots of unit, how many are imaginary?

○ A: 1 ○ B: 2

○ C: 3 ○ D: Zero

8. If ω is the complex cube root of unity then $\omega = ?$

○ A: 0 ○ B: 1

○ C: ω^2 ○ D: ω^{-1}

9. If $x^2 +1/x^2 = 27$, then the value of $x – 1/x$ is equal to ?

○ A: 5 ○ B: 4

○ C: 3 ○ D: 2

10. If the equation $x^3 + 4x^2 -2x + 5 = 0$ is divided by x+1 the remainder is?

○ A: 10 ○ B: 9

○ C: 8 ○ D: 7

11. If one root of the equation $x^2 + px + q = 0$ is double the other, p^2/q is?

○ A: 1 ○ B: 1/2

○ C: 2/9 ○ D: 9/2

12. Roots of the equation $x^2 + 2x + 3 = 0$ are?

○ A: Unequal ○ B: Real

○ C: Complex ○ D: Both A & C.

13. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is?

○ A: 12 ○ B: 4

○ C: 23/6 ○ D: 49/4

14. $1/\omega = ?$

○ A: ω ○ B: ω^2

○ C: 1 ○ D: 0

15. If the roots of $ax^2 + b = 0$ are real and distinct, then?

○ A: $ab > 0$ ○ B: $a = 0$

○ C: $a > 0$ and $b < 0$ ○ D: $ab < 0$

16. If $b^2 - 4ac$ for a quadratic equation is a perfect square the roots are?

○ A: Rational ○ B: Irrational

○ C: Complex ○ D: None of these.

17. Cube roots of 8 are?

○ A: -2, -2w and $-2w^2$ ○ B: 2, 2w and $2w^2$

○ C: 2, w and w^2 ○ D: 1, w and w^2

18. The roots of the equation $9x^2 - 12x + 4 = 0$ are?

○ A: Equal ○ B: Complex

○ C: Irrational ○ D: Unequal

19. If j and k are the roots of the equation $2x^2 - 4x + 5 = 0$ then $(j+1)(k+1) = ?$

○ A: 11/2 ○ B: -11/2

○ C: 2/11 ○ D: -2/11

20. $x^4 - 2x^3 + 8x^2 - 2x + 1$ is called?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal equation ○ D: None of the above.

TEST 3

1. **$(1 + w - w^2)^8$ = ? where w is cube root of unity**.

○ A: $256w^2$
○ B: $-256w^2$
○ C: $256w$
○ D: $-256w$

2. **For what value of m the given equation would have equal root.**
$(m + 1)x^2 + 2(m+3)x + m + 8 = 0$

○ A: ½
○ B: 1/3
○ C: -1/3
○ D: 2/3

3. **The number of real solutions of $|x|^2 + 3|x| + 2 = 0$ is?**

○ A: 1
○ B: 2
○ C: 3
○ D: 0

4. **The roots of equation $x^2 + k = 0$, $k < 0$, are?**

○ A: Complex conjugates
○ B: Real and distinct
○ C: Real and same
○ D: Rational

5. **The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is**

○ A: 2
○ B: -2
○ C: 0
○ D: None of these.

6. **If the roots of the equation $ax^2 + bx + c = 0$ are such that their sum is equal to the sum of their squares, then?**

○ A: $2ac = ab + b^2$
○ B: $2ac = a^2 + b^2$
○ C: $2ac = ab + b^3$
○ D: None of the above.

If α, β be the roots of $x^2 - 2x + 4 = 0$, $(\alpha^5 + \beta^5)$ = ?

Hint: $(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$.

○ A: 243
○ B: 81
○ C: 64
○ D: 32

7. **If the equation $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a common non-zero root, the value of λ is?**

○ A: -1
○ B: 1
○ C: 3
○ D: -3

8. **The number of real roots of $(x + 1/x)^3 + (x + 1/x) = 0$ is**

○ A: 0
○ B: 2
○ C: 4
○ D: 6

9. **If $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, the value of (a + b) is?**

○ A: 1
○ B: -1
○ C: 2
○ D: 1/2

10. **If α and β are the roots of the equation $ax^2 + bx + c$, what is equation with roots 1/α and 1/β?**

○ A: $cy^2 + by - a = 0$
○ B: $cy^2 - by - a = 0$
○ C: $y^2 + by + a = 0$
○ D: $cy^2 + by + a = 0$

11. If x = (3 + √ 5), the value of ($2x^3$ - $9x^2$ - 10 x + 13) is ?

○ A: 0
○ B: 1
○ C: 12 √ 5
○ D: None of the above.

12. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3$ is equal to

○ A: -1
○ B: 0
○ C: 1
○ D: 2

13. If one root of the equation $ax^2 + bx + c = 0$ is twice the other, then?

○ A: $2b^2 = 9ac$
○ B: $b^2 = 4ac$
○ C: $b^2 = 9ac$
○ D: $3b^2 = ac$

14. Only one of the root of the equation $ax^2 + bx + c = 0$, is zero, and a ≠ 0 if,

○ A: c = 0
○ B: c = 0 and b ≠ 0
○ C: b = 0 and c = 0
○ D: b ≠ 0 and c ≠ 0

15. If α and β are the roots of equation $ax^2 + bx + c =0$ the value of $\alpha^2+ \beta^2$ is?

○ A: $\frac{b^2 + 2ca}{a^2}$
○ B: $\frac{b^2 - 2ca}{a}$
○ C: $\frac{b^2 - 2ca}{a^2}$
○ D: $\frac{b - 2ca}{a^2}$

16. If a > 0 and x = $\sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \ldots\ldots\ldots\ldots\infty}}}}$, the value of x is

○ A: $\frac{\sqrt{4a-1}}{2}$
○ B: $\frac{1 \pm \sqrt{4a+1}}{2}$
○ C: $\frac{-1 \pm \sqrt{4a+1}}{2}$
○ D: $\frac{-2 \pm \sqrt{4a+1}}{2}$

17. The roots of the equation $3^{2x+3} + 37 = 10 (73.3^x + 1)$ are?

○ A: 2, -2
○ B: 3 , -3
○ C: 8 , 1/9
○ D: 3 , 1/3

18. Roots of the equation $x^2 + 5x -1 = 0$ are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of the above.

19. If α + β = 4 and $\alpha^3 + \beta^3 = 44$, α, β are the roots of ?

○ A: $2x^2 - 7x + 16 = 0$
○ B: $3x^2 + 9x + 11 = 0$
○ C: $9x^2 - 27x + 20 = 0$
○ D: None of the above.

TEST 4

1. The equation $x^5 + x^3 + 2x + 1 = 0$ has

○ A: No positive roots
○ B: Some positive roots
○ C: No negative roots
○ D: None of the above.

2. $(-1 + \sqrt{-3})^4 + (-1 - \sqrt{-3})^4 = ?$

○ A: 16ω
○ B: -16
○ C: 16
○ D: $16\omega^2$

3. For quadratic equations, If $b^2 - 4ac$ is a perfect square then the roots are?

○ A: Rational
○ B: Irrational
○ C: Equal
○ D: Complex

4. The number of real roots of the equation $x^6 - 7x^3 - 8 = 0$ is?

○ A: 1
○ B: 2
○ C: 3
○ D: 6

5. If $x^3 + kx^2 - 7x + 6$ is divided by $x + 2$, the remainder is -8. The value of k is?

○ A: 5
○ B: -5
○ C: 1
○ D: -1

6. If the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 58$ is divided by $(x - 2)$, then the quotient must be?

○ A: $x^3 + 5x^2 + 17$
○ B: $x^3 + 3x + 5$
○ C: $x^3 + 7x^2 + 17x + 29$
○ D: $x^3 + 17x + 29$

7. If $x^3 + x^2 + x + 1 = 0$ then possible values of x are?

○ A: 1, i, -I
○ B: -1, i^2, -i
○ C: -1, i, -I
○ D: None of the above.

8. If $x + 1/x = 1$ then $x^3 + 1/x^3$ is equal to

○ A: 1
○ B: -1
○ C: 2
○ D: -2

9. If two of the four roots of 625 are 5 and 5i then the other two roots are?

○ A: -5, -5i
○ B: 5, 5i
○ C: -25, -25i
○ D: None of the above.

10. $(x + \omega y) . (x + \omega^2 y) = ?$

○ A: $x^2 - 2xy + y^2$
○ B: $x^2 + 2xy + y^2$
○ C: $x^2 + xy + y^2$
○ D: $x^2 - xy + y^2$

11. If 5 + i be one of the roots of a given equation f(x) = 0 with real coefficients, then the lowest degree of such an equation must be?

○ A: 2
○ B: 3
○ C: 6
○ D: Not enough information given to answer the question.

12. $\left(\frac{-1-\sqrt{3}i}{2}\right)^2$ **= ?**

○ A: $\left(\frac{-1+\sqrt{3}i}{2}\right)$

○ B: 1

○ C: $\left(\frac{-1+i}{2}\right)$

○ D: $\left(\frac{-1-i}{2}\right)$

13. If α, β are the roots of the equation $x^2 + x + 1 = 0$, the equation whose roots are α / β and β / α is?

○ A: $x^2 + x + 1 = 0$

○ B: $x^2 - x + 1 = 0$

○ C: $x^2 + x - 1 = 0$

○ D: $x^2 - x - 1 = 0$

14. $1 + \omega^4$ = ?

○ A: $1 + \omega$

○ B: $-\omega^2$

○ C: 1

○ D: Both A and B.

15. if x + y = 7 and $x^2 - xy + y^2 = 13$; What are the values of x and y?

○ A: (1,2) (-1,3)

○ B: (4,5) (-2,3)

○ C: (1,5) (2,5)

○ D: (4,3) (3,4)

16. An expression of the type $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 = 0$ is called

○ A: Polynomial of degree

○ B: Polynomial of degree 1

○ C: Polynomial of degree 2

○ D: Polynomial of degree n

17. If the equations $x^2 + ax + b = 0$ and $x^2 + Ax + B = 0$ have a common root say ' t ', ' t ' must be equal to?

○ A: (B - b) / (a - A)

○ B: (a - A) / (b - B)

○ C: (a + A) / (B - b)

○ D: None of the above.

18. If 2 + i√3 is a root of the equation $x^2 + p x + q = 0$ (p & q being real), then p + q is equal to?

○ A: 3

○ B: -3

○ C: √3

○ D: - √3

19. The roots of the equation $12x^2 + mx + 5 = 0$ will be in the ratio 3 : 2, if m is equal to

○ A: 1/12

○ B: 5/12

○ C: 5 √ 10

○ D: 5/12 √ 10

Sequences & Series

TEST 1

1. **If a series has a common ratio between two terms. It is called?**

○ A: Geometric series. ○ B: Arithmetic series

○ C: Harmonic series ○ D: None of the above.

2. **Sum of infinite GP does not exist if?**

○ A: $|r| < 1$ ○ B: $|r| > 1$

○ C: $|r| = 1$ ○ D: Both B & C.

3. **Sum of infinite geometric series exists if?**

○ A: $|r| < 1$ ○ B: $|r| > 1$

○ C: $|r| = 1$ ○ D: $|r| = -1$

4. **If the sum of first n positive integers is 1/5 times the sum of their square. Then n equals?**

○ A: 5 ○ B: 6

○ C: 7 ○ D: 8

5. **Find next term for the series,**
   1, -3, 5, -7, 9, ?

○ A: -9 ○ B: -11

○ C: -13 ○ D: -15

6. **If AP has a=1, $t_n = 20$ and $S_n = 399$, then the value of n is?**

○ A: 20 ○ B: 32

○ C: 38 ○ D: 40

7. **The 6th term of HP is 1/61 and tenth term is 1/105. The first term of HP is?**

○ A: 1/39 ○ B: 1/28

○ C: 1/17 ○ D: 1/6

8. **What are the number of terms in an AP if $a_1=3$, d=7 and $a_n=59$.**

○ A: 6 ○ B: 7

○ C: 8 ○ D: 9

9. **If first two terms of H.P are 1/2 and 1/4 then fourth term is?**

○ A: 1/6 ○ B: 1/8

○ C: 1/10 ○ D: 1/12

10. **Write the first four terms of the arithmetic sequence if $a_1 = 5$ and other three consecutive terms are** 23,26,29.?

○ A: 5, 10, 15, 20 ○ B: 5,8,11,14

○ C: 5, 9, 13, 17 ○ D: None of the above.

11. 3, 6, 12 is?

○ A: AP ○ B: GP

○ C: HP ○ D: None of the above.

12. 5th term of the GP 3, 6, 12 is?

○ A: 32 ○ B: 36

○ C: 42 ○ D: 48

13. If the first and the sixth terms of a G.P are 2 and 64, then its common ratio is?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

14. If $x = 1 + y + y^2$ .... infinity. The value of y is?

○ A: $x / (x-1)$ ○ B: $x / (1-x)$

○ C: $(x-1) / x$ ○ D: $(1-x) / x$

15. Arithmetic mean is given by formula?

○ A: $(ab)^{1/2}$ ○ B: $ab / (a + b)$

○ C: $(a + b) / 2$ ○ D: None of the above.

16. Arithmetic mean between $1 - x + x^3$ and $1 + x + x^3$ is?

○ A: $1 + x^3$ ○ B: $1 - x^3$

○ C: $1 + x$ ○ D: $1 - x$

17. nth term of GP is given by formula?

○ A: $a_n=a_1r^n$ ○ B: $a_n=a_1r^{n+1}$

○ C: $a_n=a_1r^{n-1}$ ○ D: $a_n=a_1r^{n-2}$

18. The harmonic mean of $a / (1 - ab)$ and $a / (1 + ab)$ is?

○ A: $a / (1 - ab)$ ○ B: $a / (1 - a^2b^2)$

○ C: a ○ D: $1 / (1 - a^2b^2)$

19. An infinite GP is oscillatory if?

○ A: $|r| < 1$ ○ B: $|r| > 1$

○ C: $|r| = 1$ ○ D: $|r| = -1$

20. What is the geometric mean between -2i and 8i?

○ A: ±4 ○ B: ±4i

○ C: 3i ○ D: 8i

TEST 2

1. **If the numbers a, b, c, d, e form an A.P then the value of a - 4b + 6c - 4d + e is?**

○ A: 1 ○ B: 2
○ C: 0 ○ D: None of the above.

2. $\sum_{k=1}^{n} k^2 = ?$

○ A: n ○ B: n(n+1) / 2
○ C: n(n+1)(2n+1) / 6 ○ D: $[\, n(n+1)/2 \,]^2$

3. **If 5 is HM between 2 and b then the value of b is?**

○ A: 12.5 ○ B: 10
○ C: -10 ○ D: 8

4. **What is the common ratio if $a_4 = 8/27$ and $a_7 = -64/729$?**

○ A: ¼ ○ B: -1/3
○ C: -2/3 ○ D: -3/7

5. **If x, y, z are in A.P, then (x + 2y - z) (2y + z - x) (z + x - y) = ?**

○ A: xyz ○ B: 2xyz
○ C: 4xyz ○ D: 6xyz

6. **If | x | < 1 and $y = x + x^2 + x^3 + \dots \infty$, then x is equal to?**

○ A: 0 ○ B: xy
○ C: y / (1-y) ○ D: y / (1+y)

7. **The sum of the series √3 + 1/√3 + 1/3√3 .... ∞ is equal to ?**

○ A: √3 / 2 ○ B: 3√3 / 2
○ C: 3 ○ D: √3

8. **If a, b, c are in A.P as well as in G.P then?**

○ A: a = b ≠ c ○ B: a ≠ b = c
○ C: a ≠ b ≠ c ○ D: a = b = c

9. **The nth terms of the two series: 3 + 10 + 17 + ------- and 63 + 65 + 67+......... are equal. Then the value of n is?**

○ A: 9 ○ B: 13
○ C: 19 ○ D: 21

10. **If the quadratic equation $(b^2 + c^2)x^2 - 2(a + b)cx + (c^2 + a^2) = 0$ has equal roots, then**

○ A: a, b, c are in G.P ○ B: a, b, c are in A.P
○ C: a, c, b are in G.P ○ D: a, c, b are in A.P

The harmonic mean of the roots of the equation

11. $(5+\sqrt{2})x^2-(4+\sqrt{5})x+8+2\sqrt{5}=0$ is

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

12. If $a_n = (-3)\,(2/5)^n$ what the value of a_1 and r for the GP?

○ A: -6/5 and 2/5 ○ B: 6/5 and 2/5

○ C: 3/8 and 1/5 ○ D: -3/8 and 1/5

13. If in an AP $a_{25} - a_{20} = 45$, then d is equal to?

○ A: 9 ○ B: -9

○ C: 18 ○ D: 23

14. If $\frac{1}{x+y}$, $\frac{1}{2y}$, $\frac{1}{y+z}$ are in H.P, then x, y, z are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

15. For AP $T_{18} - T_8 = ?$

○ A: d ○ B: 2d

○ C: 10d ○ D: 26d

16. The value of the recurring fraction $0.0\overline{102}$ is?

○ A: 17 / 1665 ○ B: 102 / 9999

○ C: 102 / 10000 ○ D: 34 / 3339

17. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + 100^3)^{1/2} \div 100$ is?

○ A: √100 ○ B: 100

○ C: 100.5 ○ D: 50.5

18. If a, b, c, d, e, f are A.Ms (Arithmetic Means) between 2 and 12, then a + b + c + d + e + f is equal to?

○ A: 14 ○ B: 42

○ C: 64 ○ D: 82

19. The number of terms between 30 and 530, which are divisible by 11, is?

○ A: 30 ○ B: 40

○ C: 46 ○ D: 52

20. Find the sum of infinite GP 2, √2, 1 .....

○ A: 4 + √2 ○ B: 2 + 2√2

○ C: 4 + 2√2 ○ D: 2+ 7√2

TEST 3

1. **If $a^x = b^y = c^z = d^t$ and a, b, c, d are in G.P then x, y, z, and t are in?**

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

2. **If a^2, b^2, c^2 are in A.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in**

○ A: G.P ○ B: H.P

○ C: A.P ○ D: None of the above.

3. **If mth term of H.P is n and nth term is m, then (m+n)th term is?**

○ A: mn / (m+n) ○ B: m / (m+n)

○ C: n / (m+n) ○ D: (m-n) / (m+n)

4. **If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to**

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

5. **If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then a, b, c, d are in**

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

6. **If mth term of an A.P is n and nth term is m, then the (m + n)th term is ?**

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

7. **If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, and $b \neq a + c$, then a, b, c are**

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

8. **If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} (ab)^n$, where $|a|, |b| < 1$, then**

○ A: xyz = x + y + z ○ B: xy + z = xz + yz

○ C: xy + yz = xz + y ○ D: xy + xz = yz + x

9. **If $a^x = b^y = c^z$ and a, b, c are in G.P then x, y, z are in?**

○ A: A.P ○ B: H.P

○ C: G.P ○ D: None of the above.

10. If a, b, c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point and that point is

○ A: (-1. -2)
○ B: (-1, 2)
○ C: (1, -2)
○ D: (1, 2)

11. The harmonic mean of two numbers is 4. Their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 27$, the numbers are

○ A: 2, 15
○ B: 9, 12
○ C: 6, 3
○ D: 4, 8

12. Between 1 and 31 are inserted m arithmetic means, so that the ratio of the 7th and $(m - 1)$th means is 5 : 9. Then the value of m is

○ A: 12
○ B: 13
○ C: 14
○ D: 15

13. If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to

○ A: 75
○ B: 430
○ C: 864
○ D: 900

14. If the sum of an infinite G.P is 3 and the sum of the squares of its terms is also 3, then its first term and common ratio are?

○ A: 3/2, ½
○ B: 4/7, 1/3
○ C: 1, 1/2
○ D: 1/8, 3/8

15. If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P., then

○ A: p, q, r are in A.P
○ B: q^2, p^2, r^2 are in A.P
○ C: p^2, q^2, r^2 are in A.P
○ D: p, r, q are in A.P

16. If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x \, dx$, then $I_1, I_2, I_3, \ldots\ldots$ are in

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

17. The sum of integers from 1 to 100 which are not divisible by 3 or 5 is?

○ A: 2438
○ B: 4745
○ C: 2317
○ D: 2632

18. The sum of all the odd numbers of four digits which are divisible by 9 is ?

○ A: 11007000 ○ B: 4362000

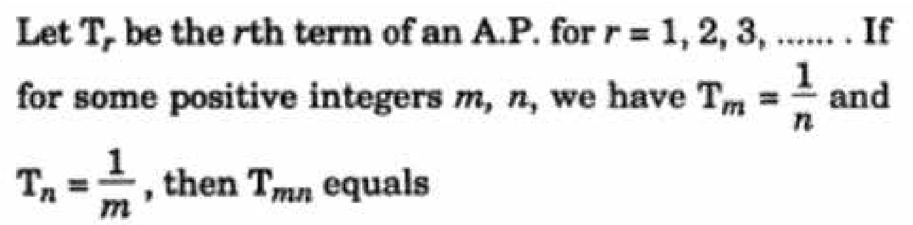
○ C: 6743000 ○ D: 2754000

19. The sum of 100 terms of the series $1^2 - 2^2 + 3^2 - 4^2 + \dots\dots$ is?

○ A: -5050 ○ B: -4720

○ C: -3870 ○ D: -2490

20.



Let T_r be the rth term of an A.P. for $r = 1, 2, 3, \dots\dots$. If for some positive integers m, n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then T_{mn} equals

○ A: 1 ○ B: 0

○ C: 1 / mn ○ D: 1/m + 1/n

TEST 4

1. 1 + 2 + 3 + 4 + ... n =?

○ A: n ○ B: n(n+1) / 2

○ C: n(n+1) / 6 ○ D: n(n+1)(2n+1) / 6

2. If 5 and 8 are two AMs between a and b. What is the value of a and b?

○ A: 3, 14 ○ B: 2, 11

○ C: 4, 13 ○ D: 2, 16

3. If a, b, c, d, e, f are in arithmetic progression, then e - c = ?

○ A: 2(c - a) ○ B: 2(d - c)

○ C: 2(f - d) ○ D: d - c

4. If a_{n-2} term of an AP is 3n-11. What is the nth term of the sequence?

○ A: 2n – 8 ○ B: 3n + 8

○ C: 3n – 5 ○ D: 7n + 12

5. If |r| < 1 then the sum of n terms of GP are given by?

○ A: $S_n = a_1 (1 + r^n) / (1 - r)$ ○ B: $S_n = a_1 (1 - r)^n / (1 - r)$

○ C: $S_n = a_1 (1 - r^n) / (1 - r)$ ○ D: $S_n = a_1 (1 - r^n) / (1 + r)$

6. **The first term of an A.P of consecutive numbers is $p^2 + 1$. The sum of 2p + 1 terms of this series can be expressed as?**

○ A: $(p+1)^2$ ○ B: $(p+1)^3$

○ C: $(2p +1) * (p+1)^2$ ○ D: $p^3 + (p+1)^3$

7. The sum of first n terms of the series 1/2 + 3/4 + 7/8 + 15/16 + ... is equal to?

○ A: $2^n - n + 1$ ○ B: $1 - 2^n$

○ C: $n + 2^{-n} – 1$ ○ D: $2^n - 1$

8. The value of $0.4\overline{23}$ is

○ A: 419 / 999 ○ B: 419 / 990

○ C: 423 / 1000 ○ D: None of the above.

9. If |r| > 1 then the sum of n terms in a GP are given by formula?

○ A: $S_n = a_1 (r^n – 1) / (r + 1)$ ○ B: $S_n = a_1 (r^n – 1) / (1 - r)$

○ C: $S_n = a_1 (1 - r^n) / (1 - r)$ ○ D: $S_n = a_1 (r^n – 1) / (r - 1)$

10. Fine the 7th term of the series 2, 6, 11, 17, ...

○ A: 41 ○ B: 47

○ C: 53 ○ D: 62

11. Arithmetic mean between $3\sqrt{5}$ and $5\sqrt{5}$ is?

○ A: $4\sqrt{5}$ ○ B: $8\sqrt{5}$

○ C: $5\sqrt{15}$ ○ D: $15\sqrt{5}$

12. Harmonic mean between 3 and 7 is?

○ A: 7/3 ○ B: 3/7

○ C: 21/5 ○ D: 32/7

13. If k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an A.P, then k is equal to?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

14. If sum of the series $1 + \frac{3}{x} + \frac{9}{x^2} + \frac{27}{x^3} + \ldots \infty$ is a finite number, then

○ A: $x < 3$ ○ B: $x > 1/3$

○ C: $x < 1/3$ ○ D: $x > 3$

15. If G.P consists of even number of terms and sum of all terms is equal to 5 times the sum of terms in odd places (meaning term 1, 3, 5, ...) then common ratio will be?

○ A: 3 ○ B: 4

○ C: 5 ○ D: 6

16. If a series has common difference between two consecutive numbers. It is called?

○ A: Geometric progression ○ B: Arithmetric progression

○ C: Harmonic progression ○ D: None of the above.

17. Which term of the AP 92, 88, 84, 80 ... is zero?

○ A: 22 ○ B: 23

○ C: 24 ○ D: 34

18. The angles of a triangle are in A.P. If the least angle is 30^0 the greatest angle is?

○ A: 45^0 ○ B: 60^0

○ C: 75^0 ○ D: 90^0

19. If a, b, c are in A.P, b - a, c - b and a are in G.P, then a : b : c is ?

○ A: 1:2:3 ○ B: 1:4:9

○ C: 2:3:4 ○ D: 1:2:4

20. If n arithmetic means are added between 2 and 38 and the sum of resulting series is 200. Then the value of n is?

○ A: 6 ○ B: 8

○ C: 9 ○ D: 10

Probability & Permutations

TEST 1

1. **If there are 3 roads from Lahore to Gujranwala and 4 roads from Gujranwala to Islamabad. How many different routes are there from Lahore to Islamabad?**

○ A: 4 ○ B: 10
○ C: 12 ○ D: 18

2. **If $^nC_8 = {}^nC_{12}$, What is value of n?**

○ A: 5 ○ B: 10
○ C: 20 ○ D: Cannot be determined.

3. **If the probability to score a century in any given match is 0.04. How many centuries the batsmen would make in 50 matches?**

○ A: 0 ○ B: 1
○ C: 2 ○ D: 3

4. **When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is?**

○ A: 1/216 ○ B: 8/27
○ C: 130/216 ○ D: 125/216

5. **A club has 20 members and you want to select the president and vice president for the club. How many different outcomes are possible if president and vice president cannot be the same person?**

○ A: 370 ○ B: 380
○ C: 390 ○ D: 398

6. **There are n points on a circle. The number of straight lines obtained by joining them is?**

○ A: $^nC_3$ ○ B: $^nC_2$
○ C: $^nC_2$ - n ○ D: ^nC_n

7. **Probability of occurance for one of the four equally likely events would be?**

○ A: 0 ○ B: 0.25
○ C: 0.75 ○ D: 1

8. **What is the probability of getting a sum 9 from two throws of a dice?**

○ A: 1/6 ○ B: 1/8
○ C: 1/9 ○ D: 1/12

9. **The number of ways of painting the faces of a cube with six different colours is?**

○ A: 1 ○ B: 6
○ C: 6! ○ D: None of the above.

10. **Which of the following is true?**

n! = n(n-1)!, 0! = 0, 4! = 4.3.2.1

○ A: iii only ○ B: i and ii only
○ C: i and iii only ○ D: i, ii and iii

11. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

○ A: 5/7 ○ B: 2/7

○ C: 3/5 ○ D: 2/5

12. A husband and a wife appear in an interview for the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that none of them will be selected?

○ A: 12/35 ○ B: 34/35

○ C: 24/35 ○ D: None of the above.

13. If you role a dice twice. What is the probability that you would get 6 both the times?

○ A: 1/3 ○ B: 1/6

○ C: 1/12 ○ D: 1/36

14. If A and B are two independent sets then P(A∩B) = ?

○ A: P(A) + P(B) ○ B: P(A) * P(B)

○ C: P(A) + P(B) – P(AᴜB) ○ D: P(A)

15. The number of diagonals of a hexagon is?

○ A: 6 ○ B: 9

○ C: 15 ○ D: 18

16. The number of ways of selecting 2 candidates out of 5 equally qualified candidates for a post is?

○ A: 10 ○ B: 8

○ C: 5 ○ D: 20

17. P, Q, R and S are to give lectures to an audience. The organizer can arrange the order of their presentations in how many ways?

○ A: 4 ○ B: 8

○ C: 12 ○ D: 24

18. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: (p+q)! ○ B: (p+q)! / p!

○ C: (p+q)! / q! ○ D: (p+q)! / p!q!

19. A set with all possible outcomes of an experiment is called?

○ A: Probability function ○ B: Event space

○ C: Sample space ○ D: Both B and C.

20. 9! / (6!3!) = ?

○ A: 72 ○ B: 84

○ C: 96 ○ D: 108

TEST 2

1. The total number of different combinations of names which can be made from the letters of the word MISSISSIPPI, using all the letters at a time?

○ A: 4!x 4!x 2! ○ B: 11! / (4!x 4!x 2!)

○ C: 11! / (10!) ○ D: 11!

2. A work is given to 3 men and their probabilities for doing the work are 1/7, 1/4, 1/6 respectively. Find the probability that the work is done?

○ A: 39/84 ○ B: 1/168

○ C: 167/168 ○ D: 23/89

3. Three identical dice are rolled. The probability that the same number will appear on each of them is?

○ A: 1/6 ○ B: 1/36

○ C: 1/216 ○ D: 3/216

4. The number of subsets of a set containing n distinct objects is?

○ A: ${}^nC_1 + {}^nC_2 + {}^nC_3 + \ldots\ldots + {}^nC_n$ ○ B: ${}^nC_0 + {}^nC_1 + {}^nC_2 + \ldots\ldots + {}^nC_n$

○ C: $2^n + 1$ ○ D: None of the above.

5. The odds against drawing 2 red balls from a bag containing 3 red and 2 white balls is?

○ A: 1 : 2 ○ B: 3 : 7

○ C: 7 : 3 ○ D: 3 : 2

6. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that either Hafeez or Afridi would face the first ball?

○ A: 2/11 ○ B: 1/11

○ C: 1/121 ○ D: 1/110

7. There are 8 persons in the room. 4 are men and 4 are women. If two persons are selected, what is the probability that both of them would be men?

○ A: ½ ○ B: 1/4

○ C: 3/7 ○ D: 3/14

8. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is?

○ A: 21/46 ○ B: 25/117

○ C: 1/50 ○ D: 3/23

9. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that neither Hafeez nor Afridi would face the first ball?

○ A: 2/11 ○ B: 1/11

○ C: 9/11 ○ D: 10/11

10. An rack has 5 black and 4 white ties. A boy pulls out 2 ties at random. The probability that 2 are of the same colour is?

○ A: 4/9 ○ B: 5/9

○ C: 5/8 ○ D: 3/8

11. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

○ A: 1/14
○ B: 1/8
○ C: ¾
○ D: 4/7

12. For any two events A and B, $P(A \cap B)$ is?

○ A: Less than $P(A) + P(B) - 1$
○ B: Greater than $P(A) + P(B)$
○ C: $P(A) + P(B) - P(A \cup B)$
○ D: $P(A) + P(B) + P(A \cup B)$

13. The probability that a man will live 10 more years is 1/4 and the probability that his wife will live 10 more years is 1/3. The probability that neither of them will be alive in 10 years is?

○ A: 1/12
○ B: 11/12
○ C: 7/12
○ D: 1/2

14. A box contains 2 white, 3 black and 4 red balls. The number of ways in which 3 balls can be drawn from the box, so that at least one of the balls is black is?

○ A: 45
○ B: 84
○ C: 64
○ D: 32

15. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

○ A: 10/21
○ B: 11/21
○ C: 2/7
○ D: 5/7

16. The chances of wining of two race horses are 1/3 and 1/6 respectively. What is the probability that atleast one will win, when the horses are running in different races?

○ A: ½
○ B: 1/8
○ C: 1/18
○ D: 4/9

17. How many signal can be made with 4 signs using any number of signs at a time?

○ A: 24
○ B: 60
○ C: 64
○ D: 82

18. How many words can be formed by taking four different letters of the word MATHEMATICS?

○ A: 7920
○ B: 1680
○ C: 1260
○ D: 68

19. ^nP_r = ?

○ A: $^nC_r * r!$
○ B: $^nC_{n-r} * r!$
○ C: $^nC_{n-r}$
○ D: Both A and B.

20. If the probability that a batsmen scores a century in any given match is 0.3. On average how many matches the batsmen would play to score his first century?

○ A: 2
○ B: 4
○ C: 15
○ D: 30

TEST 3

1. A matrix is chosen at random from the set of all 2 x 2 matrices with elements 0 and 1 only. The probability that the value of the determinant of the matrix chosen is positive is?

○ A: 1/8 ○ B: 3/16

○ C: 1/16 ○ D: 13/16

2. Six identical coins are arranged in a row. The number of ways, in which the number of tails is equal to the number of heads is?

○ A: 20 ○ B: 24

○ C: 36 ○ D: 48

3. 3 books of english and 5 books of urdu are randomly placed on a shelve. What is the probability that books on the same subject are together?

○ A: 1/56 ○ B: 1/7

○ C: 2/8! ○ D: 1/28

4. When a dice is rolled probability that even number or number greater than 4 appear is?

○ A: 5/6 ○ B: 1/6

○ C: 2/3 ○ D: 1/3

5. There are 10 lamps of different colors in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is?

○ A: 1025 ○ B: 1024

○ C: 1023 ○ D: 10!

6. Eight chairs are numbered 1 to 8. 2 women and 3 men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is?

○ A: ${}^4C_3 \, . \, {}^4C_2$ ○ B: ${}^4C_2 \, . \, {}^4P_2$

○ C: ${}^4P_2 \, . \, {}^4P_3$ ○ D: ${}^4P_2 \, . \, {}^6P_3$

7. Find the number of ways in which a mixed double tennis game can be arranged between 10 players consisting of 6 men and 4 women?

○ A: 190 ○ B: 180

○ C: 90 ○ D: 48

8. There are 18 children in the room including 9 boys and 9 girls. You call a child to give a sweet and the child goes back to the room and can potentially be chosen again. If total number of sweets are 4, what is the probability that atleast one boy gets the sweet?

○ A: 1/16 ○ B: 15/16

○ C: 9/16 ○ D: 7/18

9. If five digit numbers are formed from 1,2,3,4,8. What is the probability of forming a number with 2 and 8 not next to each other?

○ A: 2/5 ○ B: 2/7

○ C: 5/7 ○ D: 3/5

10. In how many ways 8 books including 2 English books can be arranged together such that English books are not together?

○ A: 5040 ○ B: 10080

○ C: 30240 ○ D: 40320

A person wishes to make up as many different parties as he can out of his 20 friends, such that each party consists of the same number of persons. The number of friends he should invite at a time is?

○ A: 5 ○ B: 8

○ C: 10 ○ D: 12

11. Pakistan plays two matches each with West Indies and Australia. In any match, the probabilities of Pakistan getting points 0, 1 and 2 are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of Pakistan getting at least 7 points is?

○ A: 0.8750 ○ B: 0.0875

○ C: 0.0625 ○ D: 0.0250

12. In how many ways 5 boys and 4 girls can be seated in a bench such that boys and girls occupy alternate seats?

○ A: 1240 ○ B: 1560

○ C: 2590 ○ D: 2880

13. A man invites 4 men and 4 women to a party. In how many ways can they sit around a round table, so that no two men are together?

○ A: 6 ○ B: 24

○ C: 132 ○ D: 144

14. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:?

○ A: 3/22 ○ B: 1/22

○ C: 2/91 ○ D: 3/91

15. Two different numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is? Hint: $a^2 - b^2$ is divisible by 3 if both the numbers are divisible by 3 or none of them is divisible by 3.

○ A: 2/87 ○ B: 19/87

○ C: 37/87 ○ D: 47/87

16. $^{13}C_9 - {}^{12}C_8$ is equal to?

○ A: $^{13}C_7$ ○ B: $^{13}C_9$

○ C: $^{12}C_9$ ○ D: None of the above.

17. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 points lying on them respectively. The number of triangles that can be constructed using these points as vertices is?

○ A: 205 ○ B: 208

○ C: 220 ○ D: 260

18. If A and B are two events, such that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\overline{B})=1/2$, then the events A and B are?

○ A: Independent ○ B: Dependent

○ C: Disjoint ○ D: None of the above.

19. How many necklaces can be made from 6 beads of different colors?

○ A: 60 ○ B: 120

○ C: 360 ○ D: 720

TEST 4

1. A carton contains 20 bulbs, out of which 5 are defective. If a sample of 3 bulbs is selected at random, find the probability that 2 of them are defective bulbs?

○ A: 1/16
○ B: 3/64
○ C: 9/64
○ D: 2/64

2. The number of ways in which 12 balls can be divided between two friends, one receiving 8 and the other 4 is?

○ A: 12! / 8!4!
○ B: 12!2! / 8!4!
○ C: 12! / 8!4!2!
○ D: 8!4!

3. The probability that A can solve a problem is 2/3 and the probability that B can solve the problem is 3/4. The probability that at least one of A and B will be able to solve the problem is?

○ A: 11/12
○ B: 5/12
○ C: 1/12
○ D: 1/2

4. Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 1 heads after six tosses?

○ A: 0.08
○ B: 0.17
○ C: 0.30
○ D: 0.44

5. How many 5 digit number divisible by 2 can be formed from 1,2,3,5,7?

○ A: 24
○ B: 48
○ C: 124
○ D: 132

6. Out of 40 consecutive integers, two are chosen at random. The probability that their sum is odd is?

○ A: 1/200
○ B: 1/2
○ C: 20/39
○ D: 1/20

7. Cards are drawn one by one at random from a well shuffled pack of 52 cards. What is the probability that there is only one ace in first 17 cards?

○ A: $({}^{4}C_{1} * {}^{48}C_{16}) / {}^{52}C_{17}$
○ B: ${}^{48}C_{16} / {}^{52}C_{17}$
○ C: $({}^{4}C_{1} + {}^{48}C_{16}) / {}^{52}C_{17}$
○ D: ${}^{4}C_{1} / {}^{52}C_{17}$

8. H.C.F of n !, (n + 1) ! and (n + 2) ! is?

○ A: n!
○ B: (n+1)!
○ C: (n+2)!
○ D: None of the above.

9. The number of arrangements which can be made using all the letters of the word LAUGH, if the vowels are adjacent is?

○ A: 120
○ B: 24
○ C: 48
○ D: 56

10. On the occasion of Eid festival, each student of a class sends greeting cards to others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is?

○ A: ${}^{20}C_{2}$
○ B: 2 x ${}^{20}C_{2}$
○ C: $2\ {}^{20}P_{2} - 1$
○ D: None of the above.

11. There are 4 letter boxes in a post office. In how many ways can a man post 8 different letters?

○ A: 4^{8}
○ B: 8^{4}
○ C: 8!
○ D: 4!

12. 5 men and 6 women have to be seated in a straight row, so that no two women are together. Find the number of ways in which this can be done?

○ A: 43200 ○ B: 39600

○ C: 36000 ○ D: 86400

13. The number of ways in which 5 beads of different colours can form a necklace is?

○ A: 6 ○ B: 12

○ C: 24 ○ D: 60

14. L.C.M. of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: n

15. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

○ A: ¾ ○ B: 1/3

○ C: 7/19 ○ D: 9/21

16. $^{n}P_{n}$ = ?

○ A: $^{n}C_{n}$ ○ B: $^{n+1}C_{n}$

○ C: n ○ D: n!

17. Everybody in a room shakes hand with every other person. The total number of hand shakes is 66. Find the total number of persons in the room?

○ A: 9 ○ B: 10

○ C: 11 ○ D: 12

18. A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 1/3, 1/4 respectively. What is the probability that the problem will be solved?

○ A: ¼ ○ B: 1/24

○ C: 7/24 ○ D: 3/4

19. The number of ways in which a mixed double game can be arranged from among nine married couples, if no husband and wife play in the same game is?

○ A: 1512 ○ B: 756

○ C: 3024 ○ D: 3298

20. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: C(p + q, q) ○ B: P(p + q, p)

○ C: P(p + q, q) ○ D: C(p + q, p - q)

21. If you toss four coins, what is the probability of getting two heads and two tails?

○ A: 3/16 ○ B: 1/8

○ C: 2/8 ○ D: 3/8

22. When three dice are thrown, what is the probability of getting the same number on three of them?

○ A: 1/216 ○ B: 1/36

○ C: 5/36 ○ D: 1/6

23. The number of digits that can be formed from 2, 3, 5, 7, 8 with 2 and 8 next to each other is?

○ A: 24 ○ B: 36

○ C: 48 ○ D: 72

24. An employer wants to hire 3 analysts from 6 applicants and 2 designers from 4 applicants. What is the total number of ways in which she can make the selection?

○ A: 1490 ○ B: 132

○ C: 120 ○ D: 60

25. If $^nC_{r-1} = 36$, $^nC_r = 84$ and $^nC_{r+1} = 126$, then r is equal to?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

26. Four cars are racing in a circuit. What are the total number of permutations with which they can cross the finish line?

○ A: 4 ○ B: 16

○ C: 18 ○ D: 24

27. The probability that the 1st day of a random chosen month is a Friday is?

○ A: 1/7 ○ B: 1/12

○ C: 1/19 ○ D: 1/84

28. m parallel lines in a plane are intersected by a family of n parallel lines. The total number of parallelograms so formed is?

○ A: (m-1)(n-1) / 4 ○ B: mn/4

○ C: m(m-1)(n-1)/2 ○ D: mn(m-1)(n-1)/4

29. There are 10 girls and 20 boys in a class. 5 girls and 10 boys have blue eyes. Find the probability that one student chosen at random is a girl and has blue eyes?

○ A: 2/3 ○ B: 5/6

○ C: 1/6 ○ D: 1/2

30. If $P(A \cup B) \neq P(A) + P(B)$ Then;

○ A: A and B are disjoint sets. ○ B: A and B are Independent sets

○ C: A and B are overlapping sets ○ D: A and B are unit event sets.

31. From a set of 17 cards numbered 1 to 17, one card is drawn at random. The probability that the number is divisible by 3 or 7 is?

○ A: 2/17 ○ B: 5/17

○ C: 7/17 ○ D: 9/17

32. The number of times the digit 3 will appear listing the integers from 1 to 1000 is?

○ A: 271 ○ B: 280

○ C: 297 ○ D: 300

33. Three unbiased coins are tossed. What is the probability of getting atleast one head?

○ A: ¾ ○ B: 1/4

○ C: 1/8 ○ D: 7/8

Induction & Binomial Theorem

TEST 1

1. **Which of the following is not true regarding the binomial expansion of $(a + x)^n$?**
   - ○ A: Total number of terms is n + 1.
   - ○ B: Sum of exponents of a and x in each term of expansion is equal to n.
   - ○ C: Exponent of a decrease from n to n - 1.
   - ○ D: Exponent of x increase from 0 to n.

2. **What is the coefficient of the third term for $(x + y)^5$?**
   - ○ A: 2
   - ○ B: 5
   - ○ C: 8
   - ○ D: 10

3. **What is the general term of $(x + 2/x)^4$?**
   - ○ A: $C(4,k)\ 2^k\ x^{4-2k}$
   - ○ B: $C(4,k)\ 2^k\ x^{2-2k}$
   - ○ C: $C(4,k)\ 2^k\ x^{4-k}$
   - ○ D: $C(4,k)\ 2^{2k}\ x^{2-2k}$

4. **$(x+y)^4 = ?$**
   - ○ A: $x^4 + 2x^3y + 4x^2y^2 + 2xy^3 + y^4$
   - ○ B: $x^4 + 4x^3y + 6x^2y^2 + 2xy^3 + y^4$
   - ○ C: $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$
   - ○ D: $x^4 + 4x^3y + 8x^2y^2 + 4xy^3 + y^4$

5. **If n is odd, the middle term in the expansion of $(a + x)^n$ is?**
   - ○ A: n/2 + 1
   - ○ B: n/2 and n/2 + 1
   - ○ C: (n + 1) / 2 and (n + 2) / 2
   - ○ D: (n + 1) / 2 and (n + 3) / 2

TEST 2

1. **The method of mathematical induction was devised by?**

○ A: David Hilbert ○ B: Francesco Mourolico

○ C: Issac Newton ○ D: Carl F. Gauss

2. **What is the 3rd term in the binomial expansion of**

3. $\left(\sqrt{\frac{a}{x}} - \sqrt{\frac{x}{a}}\right)^6$

○ A: -20 ○ B: 20

○ C: 15 a/x ○ D: 15 x/a

4. **Third term in the expansion of $(1 - x)^{-1}$ is?**

○ A: x^2 ○ B: $2x^2$

○ C: $-x^2$ ○ D: $-2x^2$

5. **Which of the following would have even number of terms in its expansion?**

○ A: $(a + x)^{20}$ ○ B: $(a + x)^{90}$

○ C: $(a + x)^{51}$ ○ D: Both A and B.

6. **What is the value of $(0.97)^6$ using only the first three terms of binomial expansion?**

○ A: 0.8246 ○ B: 0.8318

○ C: 0.8335 ○ D: 0.8452

7. **How many terms are there in the expansion of $(a + x)^{100}$**

○ A: 99 ○ B: 100

○ C: 101 ○ D: Cannot determine.

8. **What is the middle term in the expansion of $(4x – y)^8$?**

○ A: $19240\ x^4y^4$ ○ B: $17920\ x^4y^4$

○ C: $56220\ x^2y^2$ ○ D: $18420\ x^4y^4$

9. **What is the contant term in the expansion of $(1/z^3 + z^2)^5$?**

○ A: 10 ○ B: 16

○ C: 18 ○ D: 24

10. **What is the fourth term in the expansion of $(1 - x)^{1/2}$?**

○ A: - ¼ ○ B: - 1/2 x

○ C: $-1/8\ x^2$ ○ D: $-\ 1/16\ x^3$

TEST 3

1. For which x the 5th expansion member equals $M_5 = 105$?

$$\left(\frac{1}{2\sqrt{x}}-\frac{1}{2}\right)^{10}$$

○ A: ½

○ B: 1/4

○ C: 1/8

○ D: 2

2. If x is the sum of the odd coefficients and y is the sum of the even coefficients in a binomial expansion. Then?

○ A: $x = y/2$

○ B: $x = y$

○ C: $x = 2y$

○ D: None of the above.

3. The rule of binomial expansion for $(a + x)^n$ is valid if?

○ A: a and x both are real numbers.

○ B: a is real and x can be real or complex.

○ C: x is real and a can be real or complex.

○ D: Both a and x can be real or complex.

4. Find out the member of the binomial expansion of $(x + x^{-1})^8$ not containing x?

○ A: 7th

○ B: 6th

○ C: 5th

○ D: 4th

5. If in the expansion of $(x + y^3)^n$ the coefficient of the 3rd term is greater by 44 than the 2nd term. The value of n is?

○ A: 8

○ B: 9

○ C: 10

○ D: 11

6. Which term in the expansion of $(x - 2/x^2)^{13}$ has term x^{-2} ?

○ A: 5th

○ B: 6th

○ C: 7th

○ D: 8th

7. The sum of coefficients in the binomial expansion is equal to?

○ A: 2^n

○ B: 2^{2n}

○ C: 2^{2n-1}

○ D: 2^{n-1}

8. What is the middle term in the expansion of $(x + 1/x)^{2n}$? Where $x \neq 0$.

○ A: C(2n,n)

○ B: C(2n,n) x

○ C: C(2n,n) x^{2n}

○ D: C(2n,n) x^{3n}

9. What is the constant term in the expansion of $(x^2 - 2/x^2)^8$?

○ A: 1080

○ B: 1120

○ C: 2400

○ D: 2480

10. Which member of the binomial expansion of $(2x^3 + x^{-1})^{10}$ contains x^6?

○ A: 6th

○ B: 7th

○ C: 8th

○ D: 9th

11. What is the term containing x^{14} in the expansion of $(x^3 - 1/x^2)^{13}$?

○ A: C(13,7) $12x^{14}$

○ B: -C(13,6) $10x^{14}$

○ C: -C(13,5) x^{14}

○ D: C(13,8) $4x^{14}$

Trigonometry

TEST 1

1. 235° expressed in radians is?

○ A: $\pi / 235$
○ B: $85\pi / 49$
○ C: $47\pi / 36$
○ D: $235/\pi$

2. 1/2 rotation anti-clockwise is called?

○ A: Right angle
○ B: Straight Angle
○ C: Circle
○ D: None of the above.

3. If $5\sin\theta = 3$, $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to

○ A: ½
○ B: 1
○ C: 2
○ D: 4

4. If $\cos 3\theta = \sqrt{3}/2$; $0 < \theta < 20^{o}$ then the value of θ is?

○ A: 0°
○ B: 5°
○ C: 10°
○ D: 15°

5. If $\sec\theta - \tan\theta = 1/2$ then $\sec\theta + \tan\theta = ?$

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. $\cos A - \cos B = ?$

○ A: $2 \cos (A+B)/2 \cos (A-B)/2$
○ B: $2 \cos (A+B)/2 \sin (A-B)/2$
○ C: $2 \sin (A+B)/2 \cos (A-B)/2$
○ D: $-2 \sin (A+B)/2 \sin (A-B)/2$

7. Which of the following is not ture?

○ A: $\cot(-\theta) = -\cot\theta$
○ B: $\cos(-\theta) = \cos\theta$
○ C: $\sin(-\theta) = -\sin\theta$
○ D: $\tan(-\theta) = \tan(\theta)$

8. $\sin 30^{0} + \cos 60^{0} + \tan 45^{0}$ is equal to?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

9. In sexagesimal system angle is represented in?

○ A: Degrees
○ B: Degrees, Minutes and Seconds
○ C: Radians
○ D: Mircro radians.

10. If $\sin\theta = \cos\theta$ then $\theta = ?$

○ A: 30°
○ B: 45°
○ C: 60°
○ D: 75°

11. If the length of arc is twice the radius of the circle. Then angle subtended at the center is?

○ A: 1 radian
○ B: 2 radian
○ C: $\pi/3$ radian
○ D: $\pi/4$ radian

12. What is the period of tan 4x?

○ A: π　○ B: π/3

○ C: π/4　○ D: π/8

13. $\tan^2 x - \sin^2 x$ is equal to?

○ A: $\tan^2 x \operatorname{cosec}^2 x$　○ B: $\sin^2 x \cot^2 x$

○ C: $\sec^2 x \operatorname{cosec}^2 x$　○ D: $\tan^2 x \sin^2 x$

14. $\tan 225^{\circ}$ =?

○ A: 0　○ B: 1

○ C: √3　○ D: 1/√3

15. tan (2π - θ) = ?

○ A: tan θ　○ B: - tan θ

○ C: cot θ　○ D: - cot θ

16. If cos A = 1/√2 and sin B = 1/2 then A+B = ?

○ A: 60°　○ B: 75°

○ C: 90°　○ D: 120°

17. 1° = ?

○ A: 0.0125 radian　○ B: 0.0175 radian

○ C: 0.0225 radian　○ D: 0.0275 radian

18. 35° 20' in radians is?

○ A: 28π / 220　○ B: 53π / 45

○ C: 53π / 290　○ D: 53π / 270

19. cos (π + θ) = ?

○ A: sin θ　○ B: - sin θ

○ C: cos θ　○ D: - cos θ

20. If A = B = 60°. Then $\dfrac{cscA + cotB}{secA * tanB}$ = ?

○ A: 0　○ B: 1

○ C: ½　○ D: 1/√2

TEST 2

1. Which of the following relations is possible?

○ A: sec θ = 2/3　○ B: sin θ = 4/3

○ C: tan θ = 2014　○ D: $\cos\theta = (1+t^2) / (1-t^2)$

2. $\sec(-960^{\circ})$ = ?

○ A: 2　○ B: √2

○ C: -√2　○ D: -2

3. cos 2α = ?

○ A: sin α cos α　○ B: 2 sin α cos α

○ C: $\cos^2\alpha - \sin^2\alpha$　○ D: $\cos^2\alpha + \sin^2\alpha$

4. If α, β and γ are the angles of a triangle then sin (α + β) = ?

○ A: sin γ
○ B: cos γ
○ C: - sin γ
○ D: - cos γ

5. sin (-625°) = ?

○ A: sin 5°
○ B: cos 5°
○ C: sin 15°
○ D: cos 15°

6. Converting 21.256^o to DMS gives?

○ A: 21° 15.36'
○ B: 21° 18' 32"
○ C: 21° 15' 22"
○ D: 21° 15' 28"

7. If sin (A + B + C) = 1, tan (A - B) = 1/√3, and sec(A + C) = 2, then?

○ A: A = 120°, B = 60° and C = 0°
○ B: A = 60°, B = 30° and C = 0°
○ C: A = 60°, B = 60° and C = 60°
○ D: A = 90°, B = 60° and C = 30°

8. sin A + sin B = ?

○ A: -2 sin (A+B)/2 sin (A-B)/2
○ B: 2 cos (A+B)/2 cos (A-B)/2
○ C: 2 sin (A+B)/2 cos (A-B)/2
○ D: 2 cos (A+B)/2 sin (A-B)/2

9. The value of tan 15° + cot 15° is ?

○ A: 1
○ B: √3
○ C: √3/2
○ D: 4

10. The period of the function f(x) =cos 4x is?

○ A: π
○ B: 2π
○ C: π/2
○ D: 3π/2

11. If x = $\sin^2 \theta \cos \theta$ and y = $\cos^2 \theta \sin \theta$ then sin θ = ?

○ A: x^2 / y
○ B: y^2 / x
○ C: $(y^2 / x)^{1/3}$
○ D: $(x^2 / y)^{1/3}$

12. What is the period of cot x/7 ?

○ A: 7π
○ B: 2π/7
○ C: π/7
○ D: π/14

13. If cot θ = sin 2θ, then θ is equal to?

○ A: 45° and 90°
○ B: 45° and 90°
○ C: 90° and 60°
○ D: 60° and 30°

14. The value of $\cos^2 15° - \cos^2 30° + \cos^2 45° - \cos^2 60° + \cos^2 75°$ is?

○ A: 1
○ B: 1/2
○ C: 3/2
○ D: 2

15. If tan θ = 8/15 then what is the value of sec θ for θ lying in the quadrant III?

○ A: 15/17
○ B: -15/17
○ C: 17/15
○ D: - 17/15

16. The largest value of sinθ x cosθ is?

○ A: 1
○ B: 1/2
○ C: 1/√2
○ D: 1/√3

17. $(1 + \sec\theta)(1 - \cos\theta) = ?$

○ A: $\sin\theta$ ○ B: $\cot\theta$

○ C: $\cot\theta \cos\theta$ ○ D: $\tan\theta \sin\theta$

18. $\sec(-7\pi/4) = ?$

○ A: $\sqrt{2}$ ○ B: $-\sqrt{2}$

○ C: $2/\sqrt{3}$ ○ D: $-2/\sqrt{3}$

19. If the length of a chord of a circle is equal to the radius of that circle, the angle subtended (in radians) at the centre of the circle by the chord is?

○ A: 1 ○ B: $\pi/2$

○ C: $\pi/3$ ○ D: $\pi/6$

20. The value of $\cos 1° * \cos 2° * \cos 3° \ldots\ldots \cos 179°$ is ?

○ A: 0 ○ B: 1

○ C: 2 ○ D: -1

TEST 3

1. The perimeter of a certain sector of a circle is equal to half that of the circle of which it is a part. The circular measure of the angle of the sector is?

○ A: π ○ B: $\pi - 2$

○ C: $2\pi/3$ ○ D: $\pi - 4$

2. $\tan 3x - \tan 2x - \tan x$ is equal to?

○ A: $\tan x / (\tan 2x * \tan 3x)$ ○ B: $(\tan x)^3$

○ C: $(\tan 3x + \tan 2x + \tan x) - (\tan x * \tan 2x)$

○ D: $\tan x * \tan 2x * \tan 3x$

3. $\sin 75^o = ?$

○ A: $\frac{\sqrt{2}(\sqrt{3}+1)}{4}$ ○ B: $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$

○ C: $\sqrt{3}/4$ ○ D: $-\sqrt{3}/4$

4. The equation $\sin x \cos x = 2$ has?

○ A: One solution ○ B: Two solutions

○ C: Infinite solutions. ○ D: No solution.

5. $\cos(x+y)\sin(x-y) = ?$

○ A: $1/2 (\sin 2x - \sin 2y)$ ○ B: $1/2 (\sin 2y - \sin 2x)$

○ C: $\sin 2x - \sin 2y$ ○ D: $\sin 2x + \sin 2y$

6. $\tan(294^o) = ?$

○ A: $\cot 32^o$ ○ B: $-\cot 32^o$

○ C: $-\cot 24^o$ ○ D: $\cot 24^o$

7. If $\sin A + \sin B = x$ and $\cos A + \cos B = y$, $\cos(A - B)$ is equal to ?

○ A: $x^2 + y^2 - 2$ ○ B: $(x^2 + y^2 - 2) / 2$

○ C: $(2 - x^2 + y^2) / 2$ ○ D: $(2 - x^2 - y^2) / 2$

8. Period of cot (3x) - sin (4x) is?

○ A: πq ○ B: π/2
○ C: π/3 ○ D: π/4

9. $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = ?$

○ A: 1 ○ B: 2
○ C: tan 2θ ○ D: cot 2θ

10. (1 - cos α) / sin α = ?

○ A: cos α/2 ○ B: sin α/2
○ C: sec α/2 ○ D: tan α/2

11. 8 sin x/8 cos x/2 cos x/4 cos x/8 = ?

○ A: 4 sin x ○ B: sin x
○ C: cos x ○ D: 8 cos x

12. What is the domain of $\sqrt{\sin^{-1}2x + \pi/6}$ **?**

○ A: [1/4 , 1/2] ○ B: [-1/4 , 1/2]
○ C: [1/8 , 1/2] ○ D: [-1/8 , 1/2]

13. cos 12° + cos 48° = ?

○ A: 2 cos 30° cos 18° ○ B: - 2 cos 30° cos 18°
○ C: 2 cos 30° sin 18° ○ D: - 2 cos 30° sin 18°

14. If (x $\sin^3 \alpha + y \cos^3 \alpha$) = sin α cos α and (x sin α - y cos α = 0), then $x^2 + y^2$ = ?

○ A: 0 ○ B: 2
○ C: -1 ○ D: 1

15. If $\sin^2\theta + 3\cos\theta - 2 = 0$, $\cos^3\theta + \sec^3\theta$ is equal to?

○ A: 18 ○ B: 9
○ C: 6 ○ D: 3

16. The value of tan 1° * tan 2° * tan 3° ...... tan 89° = ?

○ A: 0 ○ B: 1
○ C: -1 ○ D: 1/2

17. If cos (A - B) = 3/5 and tan A . tan B = 2 then ?

○ A: cos A cos B = 1/5 ○ B: sin A sin B = -2/5
○ C: cos (A + B) = 1/5 ○ D: sin A sin B =4/5

18. sin 2α / (1 + cos 2α) = ?

○ A: cot α ○ B: tan α
○ C: sec α ○ D: csc α

19. Find the value of $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$

○ A: tan 3θ ○ B: cot 3θ
○ C: tan 6θ ○ D: cot 6θ

20. $\dfrac{\tan \alpha + \tan \beta}{\tan \alpha - \tan \beta} = ?$

○ A: sin (α + β) / sin (α - β) ○ B: sin (α - β) / sin (α + β)
○ C: cot (α + β) ○ D: sin α / sin (α - β)

TEST 4

1. tan (15°) = ?

○ A: (√3 + 1) / (√3 - 1) ○ B: (√3 - 1) / (√3 + 1)
○ C: √3 / (√3 + 1) ○ D: 1/3√3

2. The bottom of a pendulum describes an arc 3 ft long when the pendulum swings through an angle of 1/5 radian. The length of the pendulum in feet is ?

○ A: 15 ft ○ B: 12 ft
○ C: 5/3 ft ○ D: 3/5 ft

3. tan (π/4 + θ) tan (3π/4 + θ) is equal to ?

○ A: 0 ○ B: 1
○ C: -1 ○ D: 2

4. If tan 2 A = cot (A - 18°), then the value of A is?

○ A: 18° ○ B: 24°
○ C: 27° ○ D: 36°

5. What is the period of sec 9x ?

○ A: π ○ B: 2π/9
○ C: π/9 ○ D: π/18

6. If cot θ > 0 and sin θ < 0 then θ lies in the ?

○ A: Quadrant I ○ B: Quadrant II
○ C: Quadrant III ○ D: Quadrant IV

7. If α, β and γ are the angles of a triangle then tan (α + β) - tan γ = ?

○ A: 2 tan γ ○ B: - 2 tan γ
○ C: 0 ○ D: 1

8. 1 radian = ?

○ A: 60° ○ B: 59°
○ C: 58° ○ D: 57°

9. 6'' in radians = ?

○ A: π / 216000 radians ○ B: π / 108000 radians
○ C: π / 648000 radians ○ D: π / 3600 radians

10. The radius of a circle is 8 in. Find the angle in radians that an arc of 1 ft subtends in the center of this circle?

○ A: 1/8 ○ B: 2/8
○ C: 3/2 ○ D: π/6

11. In a triangle ABC, A = 45°, then the value of (1 + cot B) (1 + cot C) is equal to ?

○ A: 0 ○ B: 1
○ C: -1 ○ D: 2

12. If $\tan\theta = -4/3$, $\sin\theta$ = ?

○ A: -4/5 but not 4/5 ○ B: 4/5 but not -4/5
○ C: 4/5 or - 4/5 ○ D: Undefined.

13. Which of the following is true for $0^o \leq \theta < 90^o$?

○ A: $1/\sec\theta > 1$ ○ B: $1/\text{cosec}\,\theta < 1$
○ C: $\sec\theta = 0$ ○ D: $1/\cos\theta < 1$

14. Which of the following is true about θ in the quadrant II?

csc θ is positive, cos θ is positive, tan θ is positive

○ A: i only ○ B: i and ii only
○ C: ii and iii only ○ D: None of them is true

15. Domain of csc θ is θ Є R except θ = ?

○ A: nπ where n Є Z ○ B: [(2n+1)/2] π where n Є Z
○ C: nπ/2 where n Є Z ○ D: (2n+1/2)π where n Є Z

16. If $\sec\theta + \tan\theta = x$ then $\tan\theta$ = ?

○ A: $(x^2 - 1) / x$ ○ B: $(x^2 + 1) / x$
○ C: $(x^2 + 1) / 2x$ ○ D: $(x^2 - 1) / 2x$

17. Which of the following is not possible?

○ A: $\sin\theta = ¾$ ○ B: $\tan\theta = 75$
○ C: $\text{cosec}\,\theta = 5/3$ ○ D: $\cos\theta = (1 + t^2) / (1 - t^2)$

18. The value of $\sin^2 \pi/8 + \sin^2 3\pi/8 + \sin^2 5\pi/8 + \sin^2 7\pi/8$ is?

○ A: -1 ○ B: 0
○ C: 1 ○ D: 2

19. If tan A = 1/2, then tan 2A is equal to?

○ A: 1 ○ B: 1/2
○ C: 4/3 ○ D: 5/4

20. If A = B = C = 60° then $\dfrac{tanA + tanB + tanC}{tanA * tanB * tanC}$ = ?

○ A: 0 ○ B: 1
○ C: -1 ○ D: √3

Inverse Trigonometric Function

TEST 1

1. **Which of the following is true?**

   $\sin^{-1} x = (\sin x)^{-1},$ $\cos^{-1} x = (\cos x)^{-1},$ $\tan^{-1} x = (\cot x)^{-1}$

   ○ A: i and ii only
   ○ B: ii only
   ○ C: i, ii and iii
   ○ D: None of them is true.

2. **$\cos^{-1} A + \cos^{-1} B$ = ?**

   ○ A: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$
   ○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
   ○ C: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
   ○ D: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$

3. **Principal value of $\sin^{-1} (- \sqrt{3}/2)$ = ?**

   ○ A: $-2\pi/3$
   ○ B: $-\pi/3$
   ○ C: $\pi/3$
   ○ D: $2\pi/3$

4. **Range of $y = \sin^{-1} x$ is?**

   ○ A: $- \pi/2 \leq y \leq \pi/2$
   ○ B: $- \pi \leq y \leq \pi$
   ○ C: $- \pi/4 \leq y \leq \pi/4$
   ○ D: $-1 \leq y \leq 1$

   The value of $\tan^{-1} (- 1/\sqrt{3})$ is?

   ○ A: $\pi/3$
   ○ B: $- \pi/4$
   ○ C: $3\pi/4$
   ○ D: $- \pi/6$

5. **What is the value of $\tan^{-1} 3/4 + \tan^{-1} 5/12$?**

   ○ A: $\tan^{-1} 56/33$
   ○ B: $\tan^{-1} 16/33$
   ○ C: $\tan^{-1} 15/48$
   ○ D: $\tan^{-1} 16/63$

6. **$y = \tan x$ is called principal tangent function if ?**

   ○ A: - infinity < x < infinity
   ○ B: $- \pi < x < \pi$
   ○ C: $- \pi/2 < x < \pi/2$
   ○ D: $0 < x < \pi$

7. **$\cos^{-1} (-1/2)$ = ?**

   ○ A: $\pi/3$
   ○ B: $-2\pi/3$
   ○ C: $2\pi/3$
   ○ D: Both B and C.

8. **Range of $y = \cos^{-1} x$ is?**

   ○ A: $- \pi/2 \leq y \leq \pi/2$
   ○ B: $- \pi \leq y \leq \pi$
   ○ C: $0 \leq y \leq \pi/2$
   ○ D: $0 \leq y \leq \pi$

9. **$2 \tan^{-1} A$ = ?**

   ○ A: $\tan^{-1} 2A / (1 + A^2)$
   ○ B: $\tan^{-1} 2A / (1 - A^2)$
   ○ C: $\tan^{-1} A / (1 + A^2)$
   ○ D: $\tan^{-1} A / (1 - A^2)$

10. **$\cos (\cos^{-1} 1/5)$ = ?**

    ○ A: 1
    ○ B: 5
    ○ C: 1/5
    ○ D: 4/5

11. cos ($\sin^{-1} 1/\sqrt{2}$) = ?

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{2}/3$
○ C: $2/\sqrt{3}$ ○ D: 1/2

12. $\cos^{-1}$ A - $\cos^{-1}$ B = ?

○ A: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$
○ D: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

13. Which of the following function has domain ranging from - infinity to + infinity ?

○ A: $y = \sin^{-1} x$ ○ B: $y = \sec^{-1} x$
○ C: $y = \cos^{-1} x$ ○ D: $y = \tan^{-1} x$

TEST 2

1. The value of sec $\left[\tan^{-1}\left(\frac{b+a}{b-a}\right) - \tan^{-1}\left(\frac{a}{b}\right)\right]$ is

○ A: $\sqrt{3}/2$ ○ B: $\sqrt{2}$
○ C: 1 ○ D: $1/\sqrt{3}$

2. If $y = \sin^{-1} x$ then cos ($\sin^{-1} x$) = ?

○ A: $(1-x)^{1/2}$ ○ B: $(1-x)^{1/2}$
○ C: $(1-x^2)^{1/2}$ ○ D: $(1+x^2)^{1/2}$

3. cos [$\tan^{-1} 1/3 + \tan^{-1} 1/2$] = ?

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{2}$
○ C: $\sqrt{3}/2$ ○ D: 1/2

4. $\cot^{-1}$ (-1) = ?

○ A: 1 ○ B: $\pi/2$
○ C: $2\pi/3$ ○ D: $3\pi/4$

5. Principal value of $\sin^{-1}$ (sin $3\pi/5$) = ?

○ A: $3\pi/5$ ○ B: $4\pi/5$
○ C: $2\pi/5$ ○ D: $\pi/5$

6. What is the principal value of $\cot^{-1}$ ($-1/\sqrt{3}$) ?

○ A: $3\pi/2$ ○ B: $\pi/3$
○ C: $\pi/6$ ○ D: $2\pi/3$

7. $\sin^{-1} 3/5 + \sin^{-1} 8/17$ = ?

○ A: $\sin^{-1}$ (11 / 23) ○ B: $\sin^{-1}$ (19 / 76)
○ C: $\sin^{-1}$ (63 / 95) ○ D: $\sin^{-1}$ (77 / 85)

8. Which of the following is Domain and Range of $y = \cot^{-1} x$?

○ A: Domain: $-\infty < x < \infty$ Range: $-\pi/2 < y < \pi/2$
○ B: Domain: $-1 < x < 1$ Range: $-\pi/2 < y < \pi/2$
○ C: Domain: $-\infty < x < \infty$ Range: $-\pi < y < \pi$
○ D: Domain: $-\infty < x < \infty$ Range: $0 < y < \pi$

9. Principal value of $\sin^{-1}$ [sin (2π/3)] = ?

○ A: 2π/3 ○ B: -2π/3

○ C: π/3 ○ D: π/6

10. cos ($\sin^{-1}$ 3/5) = ?

○ A: 3/5 ○ B: 1/3

○ C: 4/5 ○ D: 2/√3

11. Range of y = $\tan^{-1}$ x is ?

○ A: $-\pi/2 < y < \pi/2$ ○ B: $-\pi/2 \le y \le \pi/2$

○ C: $0 \le y \le 2\pi$ ○ D: $0 < y < 2\pi$

12. $tan^{-1}\dfrac{a-b}{1+ab} + tan^{-1}\dfrac{b-c}{1+bc} = ?$

○ A: $\tan^{-1} a - \tan^{-1} c$ ○ B: $\tan^{-1} a - \tan^{-1} b$

○ C: $\tan^{-1} b - \tan^{-1} c$ ○ D: $\tan^{-1} c - \tan^{-1} a$

13. If α = 2$\cos^{-1}$ 4/5 then sin α = ?

○ A: 3/5 ○ B: 24/25

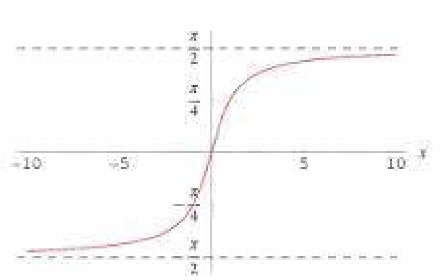
○ C: 4/5 ○ D: 30/25

14. $sin^{-1}(2x\sqrt{1-x^2}) = ?$

○ A: $\sin^{-1} x$ ○ B: $2 \sin^{-1} x$

○ C: $3 \sin^{-1} x$ ○ D: $4 \sin^{-1} x$

15. The graph below is for which function?



○ A: $y = \sin^{-1} x$ ○ B: $y = \cos^{-1} x$

○ C: $y = \tan^{-1} x$ ○ D: $y = \cot^{-1} x$

16. If $\tan^{-1}(1 + x) + \tan^{1}(1 - x) = \pi/2$ then x = ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: √3

17. y = sec x is called a principal secant function if?

○ A: $-\pi \le x \le \pi$ and $x \ne \pi/2$ or $-\pi/2$ ○ B: $-\pi/2 < x < \pi/2$

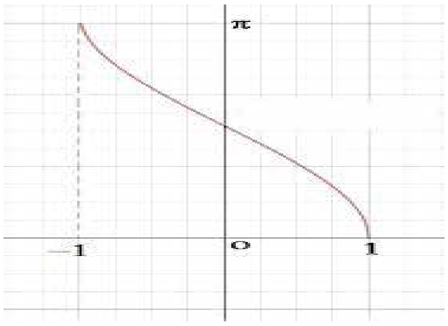
○ C: $0 \le x \le \pi$ and $x \ne \pi/2$ ○ D: $0 \le x < \pi/2$

18. If α = $\sin^{-1}$ 5/13 , then cos α = ?

○ A: 8/13 ○ B: 7/13

○ C: 11/13 ○ D: 12/13

19. The graph below is for which function?



○ A: $\sin^{-1} x$ ○ B: $\cos^{-1} x$

○ C: $\tan^{-1} x$ ○ D: $\cot^{-1} x$

20. $\operatorname{cosec}^{-1} (-2/\sqrt{3}) = ?$

○ A: $\pi/3$ ○ B: $-\pi/3$

○ C: $4\pi/3$ ○ D: $-4\pi/3$

TEST 3

1. $\sin (\sin^{-1} 1/5 + \cos^{-1} x) = 1$ then $x = ?$

○ A: 2/5 ○ B: 1/3

○ C: 1/5 ○ D: 1/2

2. $\sin (2\cos^{-1} x) = ?$

○ A: $2x\sqrt{1-x^2}$ ○ B: $2x\sqrt{1-x}$

○ C: $\dfrac{2x}{\sqrt{1-x^2}}$ ○ D: $\dfrac{2x}{\sqrt{1+x^2}}$

3. Domain and range of $y = \csc^{-1} x$ is ?

○ A: Domain : $-\infty < x < \infty$ Range : $-\pi/2 \le y \le \pi/2$

○ B: Domain : $-1 \le x \le 1$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ C: Domain : $1 \le |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ D: Domain : $1 > |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

4. $\sin (\cos^{-1} -2/3) = ?$

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{5}/3$

○ C: $1/\sqrt{3}$ ○ D: $\sqrt{3}$

5. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, what is the value of x?

○ A: 1/6 ○ B: -1

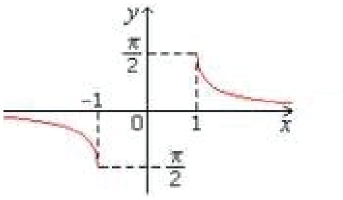
○ C: -1 and 1/6 ○ D: 1

6. $\cos^{-1} (\cos 7\pi/6) = ?$

○ A: $7\pi/6$ ○ B: $\pi/6$

○ C: $5\pi/6$ ○ D: $\pi/3$

7. The graph below is for which function?



○ A: $y = \tan^{-1} x$
○ B: $y = \cot^{-1} x$
○ C: $y = \sec^{-1} x$
○ D: $y = \csc^{-1} x$

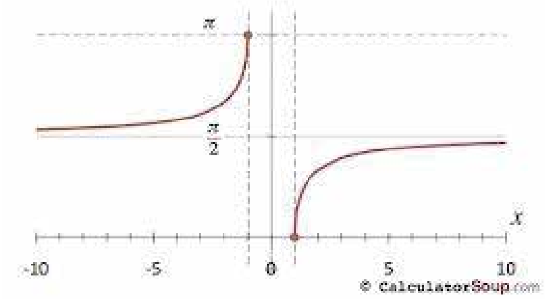
8. If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$, then $\cos^{-1} x + \cos^{-1} y$ is equal to ?

○ A: $2\pi/3$
○ B: $3\pi/2$
○ C: $\pi/5$
○ D: $\pi/3$

9. $\tan^{-1} (-x) = ?$

○ A: $\tan^{-1} (x)$
○ B: $- \tan^{-1} (x)$
○ C: $- \cot^{-1} (x)$
○ D: $\cot^{-1} (x)$

10. The graph below is for which function?



○ A: $y = \tan^{-1} x$
○ B: $y = \cot^{-1} x$
○ C: $y = \csc^{-1} x$
○ D: $y = \sec^{-1} x$

11. $\tan (\sin^{-1} x) = ?$

○ A: $x / (1-x^2)$
○ B: $x / (1-x)$
○ C: $\frac{x}{\sqrt{1+x^2}}$
○ D: $\frac{x}{\sqrt{1-x^2}}$

12. $\sin\left[\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right] =$

○ A: $\sqrt{3}/2$
○ B: $-\sqrt{3}/2$
○ C: ½
○ D: - 1/2

13. The value of $\tan (\cos^{-1}(4/5) + \tan^{-1} (2/3))$ is equal to ?

○ A: 7/5
○ B: 17/6
○ C: 17/18
○ D: Cannot be determined.

14. The value of $\tan^{-1}1 + \tan^{-1} 2 + \tan^{-1} 3$ is ?

○ A: $\pi/2$
○ B: -1
○ C: 1
○ D: 0

15. tan ($\sin^{-1}$ -3/4) = ?

○ A: 3/√5 ○ B: -3/√5

○ C: 3/√7 ○ D: -3/√7

16. Value of cos ($\tan^{-1}$ 15/8 - $\sin^{-1}$ 7/25) = ?

○ A: 114/350 ○ B: 297/425

○ C: 215/345 ○ D: 138/147

17. The product of the roots of the equation $\tan^{-1}$ (2x) + $\tan^{-1}$ (3x) = 3π/4 is ?

○ A: -1/6 ○ B: -1/2

○ C: 1 ○ D: 3

Function And Limits

TEST 1

1. If f(x,y,z)=2x+3y-z and f(a,b,0)=f(0,a,b), then b / a equals

○ A: 0 ○ B: 2

○ C: ½ ○ D: 1/4

2. Range of the function $f(x) = \sqrt{36 - x^2}$ **is**

○ A: $[0, -\infty]$ ○ B: $[\infty, -\infty]$

○ C: $[0, 6]$ ○ D: $[36, 1]$

3. If f(x) = $3x^2$ - 2x + 4, f(-2) =

○ A: -2 ○ B: 20

○ C: 4 ○ D: 12

4. If g(x) = x^3 - x^2 - x - 1, then the value of g(-1) is:

○ A: 0 ○ B: 1

○ C: -2 ○ D: 2

5. Let f(x) = $3x^2$ + 4, g(x) = 2 and h={(1,2),(2,1),(3,2)}.

○ A: f(x) is the only function. ○ B: f(x) and g(x) are the only functions.

○ C: f(x), g(x) and h(x) are all functions.

○ D: None of these are functions.

6. If f(x)=3 and g(x)=2, then f(g(x))=

○ A: 2 ○ B: 3

○ C: 6 ○ D: 5

7. Range of the function $f(x) = 2x - 3$ **is**

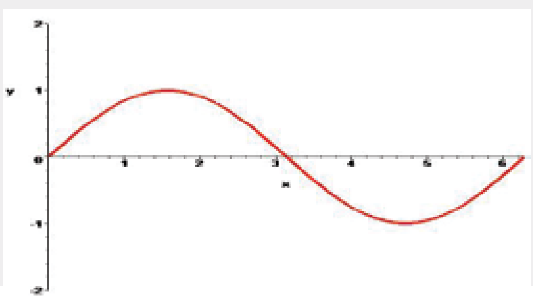
○ A: $(-\infty, +\infty)$ ○ B: [2,3]

○ C: [2,10] ○ D: None of the above.

8. If f(x)=2x+3 and g(x) = x^2 - 1, then f(g(2))=

○ A: 4
○ B: 9
○ C: 13
○ D: 19

9. The following figure shows a graph of which type of function?



○ A: Sine
○ B: Cosine
○ C: Tangent
○ D: Log

10. If p(x)=4x-6 and p(a)=0, then a=

○ A: 3
○ B: 2
○ C: 3/2
○ D: 2/3

11. If f(x)=x and g(x)=x.f(x), then f(x) / g(x) =

○ A: x
○ B: 1/x
○ C: 1
○ D: None of the above.

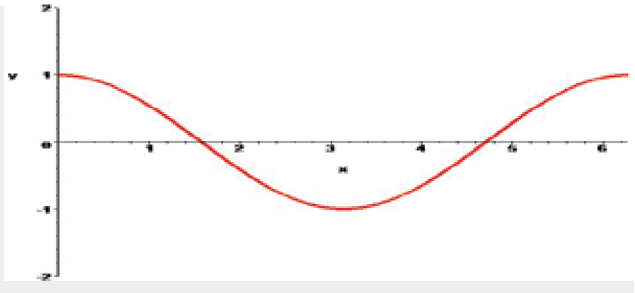
12. If $f(x) = x^7 - 97x^6 - 199x^5 + 99x^4 + 2x + 195, f(-1)$ equals:

○ A: 24
○ B: 154
○ C: 272
○ D: 393

13. What value(s) must be excluded for the domain of f={(x,y):y=$\frac{x+2}{x-2}$}?

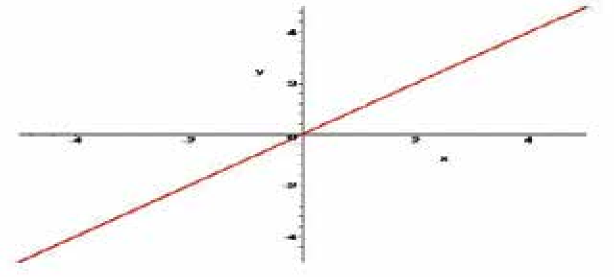
○ A: 2
○ B: -2
○ C: 0
○ D: 2 and -2

14. The following figure shows a graph of which type of function?



○ A: Sine
○ B: Cosine
○ C: Tangent
○ D: Log

15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the Above

16. If f(1) = 1 and f(2) = 2 and f(-1) = -1, then f(x) would be:

○ A: 0 ○ B: 1

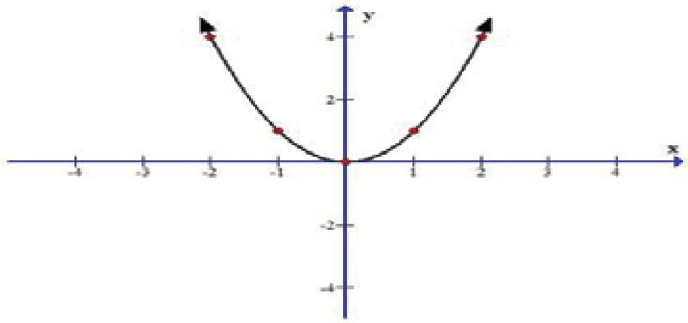
○ C: 2 ○ D: x

17. If $f(r,\theta) = r\cos\theta,\ f(2,\frac{\pi}{3}) =$

○ A: 2π ○ B: 1

○ C: $\frac{\pi}{6}$ ○ D: $\frac{1}{2}$

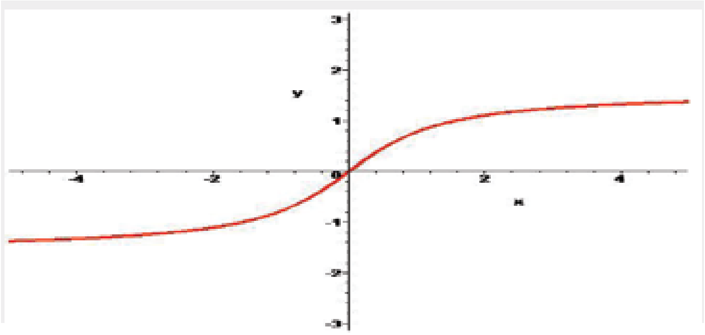
18. Which of the following functions represents the plot shown?



○ A: f(x) = x^2 ○ B: f(x) = x^2 - x - 5

○ C: f(x) = x^3 ○ D: None of the above.

19. The following figure shows a graph of which type of function?



○ A: Cosecant ○ B: Secant

○ C: Cotangent ○ D: Arctangent

20. If f(x, y, z) = $x^2 + y^2$ **-2z for all real numbers x, y and z, then f(-1,-1,-1)=**

○ A: 0 ○ B: 2

○ C: 4 ○ D: 6

TEST 2

1. If f(x,y)=3x+2y-8 and g(z) = z^2 for all real numbers x,y,z then f(3,g(4))=

○ A: 15
○ B: 33
○ C: 45
○ D: 25

2. For a function to be even as well as odd, it must be:

○ A: Symmetric about origin (by 180^0)
○ B: Symmetric about y-axis (by 180^0)
○ C: Both A and B
○ D: None of the above

3. If g(x)=3 and $f(x) = \dfrac{1}{3x+2}$, then f(g(3))=

○ A: 1/11
○ B: 1/17
○ C: 3/5
○ D: 9/11

4. Which statement is correct for the following functions?

$$f(x) = \frac{2}{7}x^2, \qquad g(x) = -x^3$$

○ A: Both I and II are even.
○ B: Both I and II are odd.
○ C: I is even and II is odd.
○ D: I is odd and II is even.

5. If f(x) = x+3 and g(x) = x^2 , for what value of does f(g(x))=g(f(x))

○ A: 1
○ B: 0
○ C: -1
○ D: 2

6. Which of the following relations are said to be odd?

$y=x^2 + 1$, $y=\sin(x)$, $y = x^3 - x + 1$

○ A: Only II.
○ B: Only I & II.
○ C: Only I & III.
○ D: Only II & III.

7. ***Find the inverse of*** $g(x) = \dfrac{2x}{x-1}$

○ A: $g^{-1}(y) = \dfrac{y+5}{y-2}$
○ B: $g^{-1}(y) = \dfrac{y}{y-2}$
○ C: $g^{-1}(y) = \dfrac{y-7}{y}$
○ D: $g^{-1}(y) = \dfrac{y+4}{y-2}$

8. If f(x) = $x^2 + 3x - 4$ and g(x)=x-4, then f(g(x))=

○ A: $2x^2 - 3x + 2$
○ B: $2x^2 - 3x$
○ C: $x^2 - 5x + 10$
○ D: $x^2 - 5x$

9. Find $\lim\limits_{x\to 1} \dfrac{\sqrt{x}-1}{x-1}$

○ A: ¼
○ B: 1/2
○ C: 1
○ D: 2

10. Assuming that $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ exist, which of the following is correct:

○ A: If $f(x) \geq 0$, then $\lim_{x \to a} f(x) \geq 0$

○ B: If $f(x) \geq g(x)$, then $\lim_{x \to a} f(x) \geq \lim_{x \to a} g(x)$

○ C: If $f(x) \geq 0$, then $\lim_{x \to a} \sqrt{f(x)} = \sqrt{\lim_{x \to a} f(x)}$

○ D: All are correct.

11. If {(3,2),(4,2),(3,1),(7,1),(2,3)} is to be a function, which of the following must be removed from the set?

○ A: (3,2)
○ B: (4,2)
○ C: (2,3)
○ D: None of the above.

12. To show a function is discontinuous, we can do one of three things:

Show that the function fails the sequence definition, Show that the function fails the ε -> δ definition

Prove by contradiction by relating it to a function known to be discontinuous

○ A: Only (i) is correct.
○ B: Only (i) and (iii) are correct.
○ C: None of these are correct.
○ D: (i), (ii) and (iii) are correct.

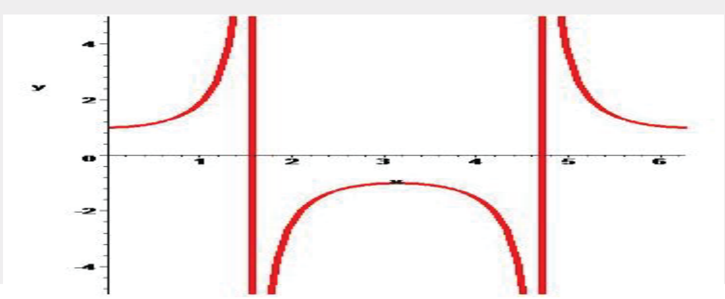
13. If f(x,y)=x+y and g(x,y)=x-y, then f(g(2,1),f(2,-1)) equals:

○ A: 0
○ B: 1
○ C: 2
○ D: 4

14. Range of the function f(x)= sin (x) is

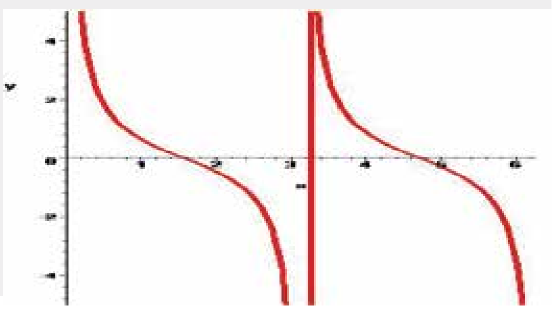
○ A: [-1,1]
○ B: $[-\frac{\pi}{2}, \frac{\pi}{2}]$
○ C: [0,1]
○ D: None of the above.

15. The following figure shows a graph of which type of function?



○ A: Tangent
○ B: Secant
○ C: Cosecant
○ D: Cosine

16. The following figure shows a graph of which type of function?



○ A: Cotangent
○ B: Arctangent
○ C: Cosecant
○ D: Tangent

17. f(x)=cos x, g(x)=sin x, h(x) = ±√x

○ A: f(x) is the only function.

○ B: g(x) is the only function.

○ C: f(x) and g(x) are the only function.

○ D: All three are functions.

18. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is not true:

○ A: $\lim_{x\to a}(f(x) \pm g(x)) = \lim_{x\to a} f(x) \pm \lim_{x\to a} g(x)$

○ B: $\lim_{x\to a}(f(x)g(x)) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$

○ C: $\lim_{x\to a} \dfrac{f(x)}{g(x)} = \dfrac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$

○ D: $\lim_{x\to a} |f(x)| = -\left|\lim_{x\to a} f(x)\right|$

19. If $f(x, y) = 2x^2 - y^2$ and $g(x) = 2^x$, which of the following equal 2^{2x} ?

○ A: f(x,g(x))

○ B: f(g(x),x)

○ C: f(g(x),g(x))

○ D: f(g(x),0)

20. If $f(x) = 4x + 2$ for all x, then for x=0.5 $f^{-1}(x) =$?

○ A: 4

○ B: $\frac{1}{16}$

○ C: $\frac{1}{4}$

○ D: $-\frac{3}{8}$

TEST 3

1. If g(x-1)= x^2 + 2, then g(x)=

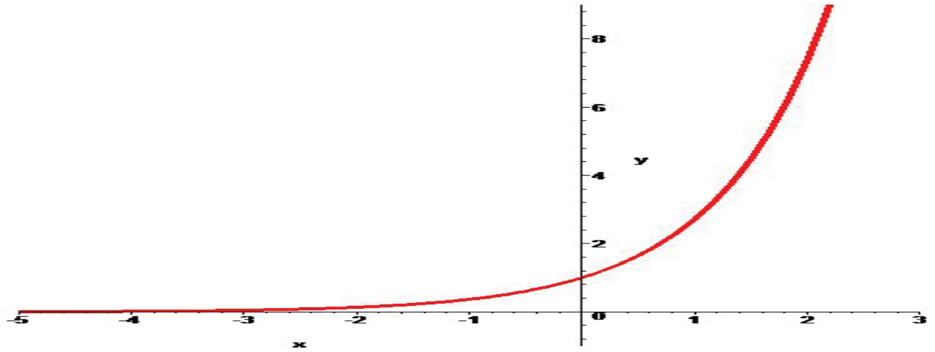
○ A: x^2 - 2x + 3

○ B: x^2 + 2x + 3

○ C: x^2 - 2x + 6

○ D: x^2 - 2x

2. The following figure shows graph of which type of function?



○ A: Log Function

○ B: Exponential Growth

○ C: Exponential Decay

○ D: None of the above.

3. If $f(x) = 3x - 5$ and $g(y) = y^2 - 1$, then f(g(z)) equals

○ A: $(3z - 5)^2 - 1$

○ B: $3z^2 - 8$

○ C: $3z^3 - 5z^2 - 3z + 8$

○ D: $x^2 + 3z - 8$

4. $\lim\limits_{x \to 0} \dfrac{\cos(2x) - 1}{\cos x - 1}$ **= ?**

○ A: 2

○ B: 4

○ C: 8

○ D: 10

5. $\lim\limits_{h \to 0} \dfrac{\cos h - 1}{h} =$

○ A: -1

○ B: 0

○ C: 1

○ D: 2

6. $\lim\limits_{x \to 0} \dfrac{x^4 + 5x - 3}{2 - \sqrt{x^2 + 4}}$ **= ?**

○ A: 6

○ B: 15

○ C: ∞

○ D: None of the above.

7. If f(x) = x^2 - 4, for what real number values of x will f(f(x))=0?

○ A: $\sqrt{6}$

○ B: $\pm\sqrt{6}$

○ C: $\pm\sqrt{2} or \pm \sqrt{6}$

○ D: No values

A straight line function, whose graph bisects the second and the fourth quadrants will have a value of .... , when the value of 'x' is 'a'.

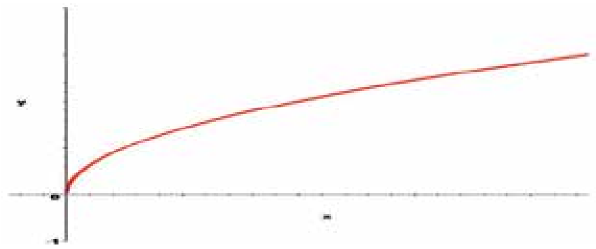
○ A: a

○ B: -a

○ C: -2a

○ D: 0

8. The following figure may show a graph of which function?



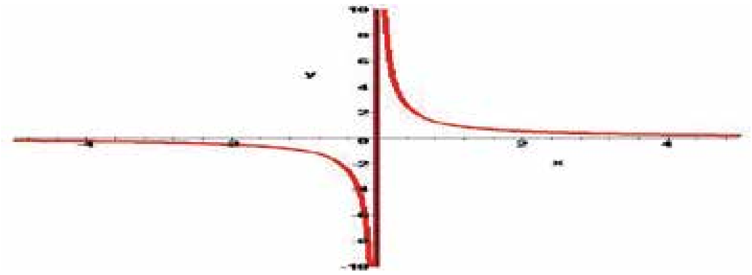
○ A: $y = \sqrt{x}$

○ B: $y = \sqrt[6]{x}$

○ C: $y = \sqrt[5]{x}$

○ D: Both A and B.

9. The figure shown below depicts a graph of which of the following functions?



○ A: y=x+5 ○ B: $y = x^2 / (x+2)$

○ C: $y = x^3 - 4$ ○ D: $y = 1 / x^3$

10. If $f(x) = 2^x$, then $f(\log_2 5)$=

○ A: 2^5 ○ B: 2^2

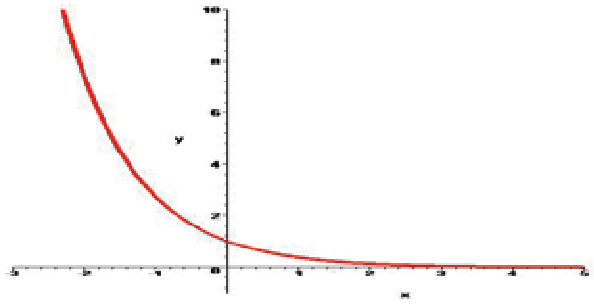
○ C: 2 ○ D: 5

11. If f is a linear function and f(1)=-2,f(-2)=1 and f(x)=1.5, what is x?

○ A: 0.5 ○ B: -0.5

○ C: -1.5 ○ D: -2.5

The wing figure shows a graph of which type of function?



○ A: Log function ○ B: Exponential Growth

○ C: Exponential Decay ○ D: None of the above.

12. If $f(x) = 3 - 2x + x^2$, then $\dfrac{f(x+t) - f(x)}{t}$ equals

○ A: t-x+4 ○ B: t+2

○ C: t+2x-2 ○ D: 2x-2

13. To show a function is continuous, we can do one of three things:

Show it satisfies the sequence definition of continuity, Show it satisfies the ε -> δ definition of continuity

Decompose it into simpler functions we already know to be continuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

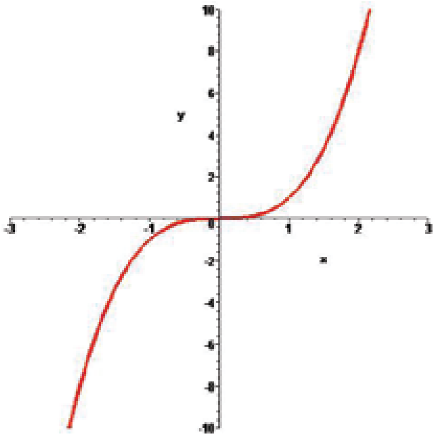
○ C: (i), (ii) and (iii) are correct. ○ D: None of these are correct.

14. **If** $f(x)=\left\{\begin{array}{ccc}\frac{5}{x-2} & when & x\neq 2\\ k & when & x=2\end{array}\right\}$**, what must the value 'k' equal in order that f(x) be a continuous** function?

○ A: 2 ○ B: 5

○ C: 0 ○ D: No value of k will make f(x) a continuous function.

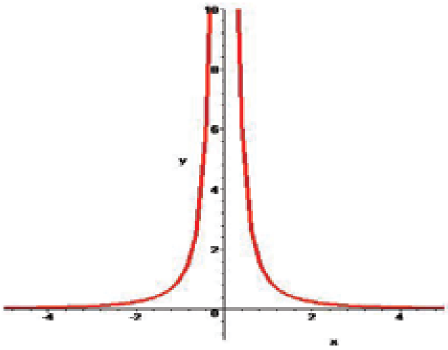
15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the above.

16. The figure shown below depicts a graph of which of the following functions?



○ A: $y = x^2 + 2x + 3$ ○ B: $y = 1 / x^2$

○ C: $y = 1 / x^3$ ○ D: None of the above.

17. If $f(x)=\dfrac{3x-1}{2}$ **and f(g(x))=x, then g(x)=**

○ A: $\dfrac{2x-1}{3}$ ○ B: $\dfrac{2x+1}{3}$

○ C: $\dfrac{2x}{3}+1$ ○ D: $\dfrac{2x}{3}-2$

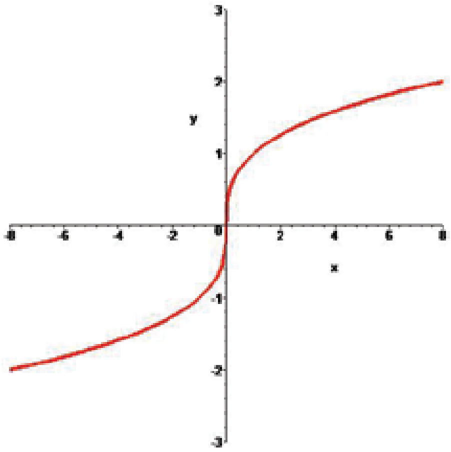
18. A straight line function, whose graph bisects the first and the third quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: 0 ○ B: 1

○ C: a ○ D: 2a

TEST 4

1. **The figure shown may depict a graph of which of the following functions?**



○ A: $y = \sqrt[3]{x}$
○ B: $y = \sqrt[4]{x}$
○ C: Both A and B.
○ D: None of the above.

2. **Find** $\lim\limits_{x \to \infty} \dfrac{x^2 + 5x + 1}{2x^2 - 10}$

○ A: 1/6
○ B: 1/4
○ C: ½
○ D: 1

3. **Domain of the function f(x) = $5x^3 + 4x^2 + 2x - 5$ is:**

○ A: (-∞ , +∞)
○ B: (-4,4)
○ C: (-5,5)
○ D: None of the above.

4. **f={(x,y):y=4}, g={(x,y):$x^2 - y^2$=1}, and h={(x,y):x=3}, which of the these is a function?**

○ A: f only
○ B: g only
○ C: h only
○ D: f and h only

5. **If f(x) = $x^2 + 1$ and f(g(x))=4x-3, then g(x)=**

○ A: $2\sqrt{x} - 1$
○ B: $2\sqrt{x - 1}$
○ C: $\sqrt{x - 1}$
○ D: x-4

6. **If g(x)=3x+2 and g(f(x))=x, then f(2)=**

○ A: 2
○ B: 6
○ C: 0
○ D: 8

7. **If f(x,y)=2x-y and g(z)=sin z, then** $g(f(\pi, \frac{\pi}{2}))$ **equals:**

○ A: 0
○ B: -1
○ C: 1
○ D: 2

8. Which of the following is the inverse of the function $f(x) = \sqrt{x} - 1$, for all x>0?

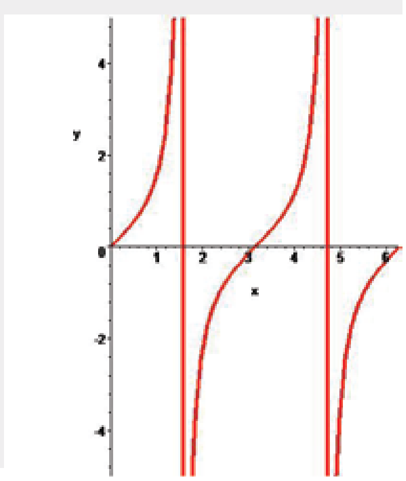
○ A: $(x+1)^2$

○ B: $x^2 + 2$

○ C: x+1

○ D: x-2

9. The following figure shows a graph of which type of function?



○ A: Sine

○ B: Cosine

○ C: Tangent

○ D: Log

10. If $f(x) = x - \frac{1}{x}$, then $f(a) - f(\frac{1}{a})$ equals:

○ A: 0

○ B: 2a - 2/a

○ C: a - 1/a

○ D: 1

11. If f(x)=2x-3, the inverse of f(x) could be represented by:

○ A: $f^{-1}(x) = 3x - 2$

○ B: $f^{-1}(x) = \frac{1}{2x-3}$

○ C: $f^{-1}(x) = \frac{x+2}{3}$

○ D: $f^{-1}(x) = \frac{x+3}{2}$

12. What value(s) must be excluded for the domain of $\frac{f}{g}(x)$ if $f(x) = 3x^2 - 4x + 1$ and $g(x) = 3x^2 - 3$?

○ A: 0

○ B: 3

○ C: 1

○ D: both ±1

13. $\lim\limits_{x=3} = \frac{5x^2 - 8x - 13}{x^2 - 5}$ = ?

○ A: 0

○ B: 5

○ C: -2

○ D: 2

14. If f(g(x)) = x^2 - 10 and g(x)=x+3 , then f(x)=

○ A: $x^2 + 6x + 8$

○ B: $x^2 - 6x - 1$

○ C: $x^2 - 6x$

○ D: $x^2 + 8$

15. If f(x)=x, the inverse of f, f^{-1}, could be represented by:

○ A: $f^{-1}(x) = x$ ○ B: $f^{-1}(x) = 1$

○ C: $f^{-1}(x) = y$ ○ D: $f^{-1}(x) = \frac{1}{x}$

16. If f(x) = x^3 - 4, then the inverse of f=

○ A: $-x^3 + 4$ ○ B: $\sqrt[3]{x+4}$

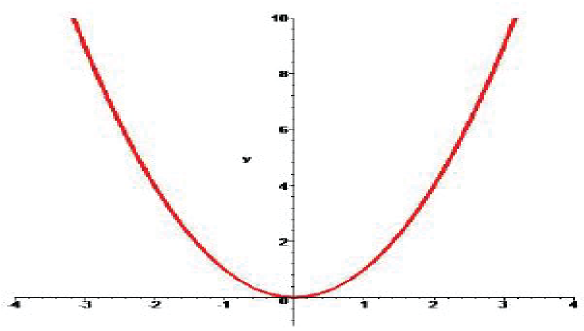
○ C: $\sqrt{x-4}$ ○ D: $\frac{1}{x-4}$

17. Find $\lim_{x \to 4} \frac{x^2 - 6x + 8}{x - 4}$.

○ A: -2 ○ B: 0

○ C: 2 ○ D: 4

18. The following figure shows graph of which type of function?



○ A: Linear function ○ B: Even degree polynomial

○ C: Inverse of even degree polynomial ○ D: Inverse of odd degree polynomial

19. Find $\lim_{x \to \infty} \frac{3x^2 + 1}{4x^3 + 2x + 1}$

○ A: 0 ○ B: 4

○ C: 10 ○ D: 15

20. If f(x) = ax^2 + bx + c and f(1) = 3 and f(-1) = 3, then a+c equals

○ A: -3 ○ B: 0

○ C: 3 ○ D: 6

Differentiation

TEST 1

1. $\lim_{x \to 0} \frac{1 - \cos x}{x} = ?$

○ A: 1
○ B: 0
○ C: -1
○ D: Infinity

2. **d/dx f(x).g(x) = ?**

○ A: f(x).g(x)
○ B: f'(x).g(x) + f(x).g'(x)
○ C: f'(x).g(x) - f(x).g'(x)
○ D: f'(x).g'(x) + f(x).g(x)

3. **d/dx Sin^{-1} x = ?**

○ A: $1/(1-x^2)^{1/2}$
○ B: $-1/(1-x^2)^{1/2}$
○ C: $1/(1+x^2)^{1/2}$
○ D: $-1/(1+x^2)^{1/2}$

4. **What is the derivative of $(2x + 3)^5$?**

○ A: $10(2x + 3)^4$
○ B: $10(2x + 3)^6$
○ C: $5(2x + 3)^4$
○ D: $5(2x + 3)^6$

5. **dy/dx of f(x) = log(log (x)) is ?**

(Please assume log as "Log to the base e" or Ln)

○ A: 1 / log x
○ B: x / log x
○ C: 1 / (x log x)
○ D: 2 / log x

6. $\frac{d}{dx} log(\sin x) = ?$

○ A: tan x
○ B: cot x
○ C: 1 / sin x
○ D: 1 / cos x

7. **If $y=e^x$, then the rate of change of y with respect to x at point (0,1) is?**

○ A: e
○ B: 1
○ C: -1
○ D: 2

8. **Under which of the following condition the given expression is true?**

$$\frac{f(x_1) - f(x)}{x_1 - x} = f'(x)$$

○ A: As x approaches the value of x_1.
○ B: As x_1 approaches the value of x.
○ C: As x approaches the value of 0.
○ D: Both A and B.

9. $\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} = ?$

○ A: f'(x)
○ B: ∫ f(x)dx
○ C: ∫ f'(x)dx
○ D: None of the above.

10. If $y = 1/x^2$ then dy/dx at x = -2 is ?

○ A: ¼ ○ B: 1

○ C: ½ ○ D: -1/2

11. d/dx sin x at x = π/2 is?

○ A: 1 ○ B: -1

○ C: √2/2 ○ D: 0

12. d/dx ($\cos^2 x + \sin^2 x$) = ?

○ A: 2 sin x + 2 cos x ○ B: 0

○ C: 2 sin x cos x ○ D: 1

13. Which of the following statement is false?

○ A: d/dx c = 0 ; where c is a constant. ○ B: d/dx [c f(x)] = c d/dx f(x)

○ C: d/dx [f(x) * g(x)] = d/dx f(x) * d/dx g(x)

○ D: d/dx [f(x) + g(x)] = d/dx f(x) + d/dx g(x)

14. Who is/or thought to be the inventor of differential calculus and fundamental theorums of calculus?

○ A: Albert Einstien. ○ B: Isaac Newton.

○ C: Gottfried Leibniz ○ D: Both B and C.

15. Derivative of ln e^{4x} w.r.t x is?

○ A: 4 ○ B: 4x

○ C: $1/e^{4x}$ ○ D: e^{4x}

16. The slope of a curve at point P = 7. If dx = 0.01 and it is very close to P then dy =?

○ A: 0 ○ B: 0.7

○ C: 0.07 ○ D: 0.49

17. The equation of a line is y = 9/4 x - 33. What is the property of dy/dx?

○ A: It is increasing. ○ B: It is decreasing.

○ C: It is a constant value. ○ D: It is first increasing and then decreasing.

18. $\frac{d}{dx}x^n \;=?$

○ A: nx ○ B: nx^n

○ C: nx^{n-1} ○ D: $1/n+1\ x^{n+1}$

19. What is the derivative of $1/(ax + b)^n$?

○ A: $-n\,(ax + b)^{-n-1}$ ○ B: $-an\,(ax + b)^{n-1}$

○ C: $-an\,(ax + b)^{-n-1}$ ○ D: $-n\,(ax + b)^{n-1}$

20. $\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} =?$

○ A: f' (x) ○ B: dy / dx

○ C: ∫ f''(x)dx ○ D: All of the above.

TEST 2

1. If the tangent to the graph of f(x) at the point "a" makes an angle of 45° with the x-axis, then what is the value of f'(x)?

○ A: 0
○ B: 1
○ C: 2
○ D: Not enough information.

2. The function f(x) = cot (x) sin (x) has how many stationary points in the interval [0 , 2π]?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

3. Which of the following is the correct expansion of sin x as Maclaurin series?

○ A: $1 - x + x^2 - x^3$ ....
○ B: $x - x^3/3! + x^5/5! - x^7/7!$ .....
○ C: 1 + x/1! - 2x/2! + 3x/3! .....
○ D: 1 + 0.1x + 0.01x + 0.001x ....

4. Which of the following is not true?

○ A: $a = d^2s/dt^2$
○ B: a = dv/dt
○ C: $v = \int a\, dt$
○ D: $v = \int s\, dt$

5. $\frac{d}{dx}(\frac{a+x}{a-x}) \; =?$

○ A: 0
○ B: $2(a+x) / (a-x)^2$
○ C: $2a / (a-x)^2$
○ D: $a / (a-x)^2$

6. What are the two positive integers, whose sum is hundred and product is maximum?

○ A: 30, 70
○ B: 45, 55
○ C: 43, 57
○ D: 50, 50

7. Value of e is equal to which of the following infinite series?

○ A: 1 + 1/1! + 1/2! + 1/3! ...
○ B: 1 + 0.1 + 0.01 + 0.001 ...
○ C: $1 - 1^3/3! + 1^5/5! - 1^7/7!$ ....
○ D: 1! - 2! + 3! - 4! ...

8. What is the derivative of $(1 + \tan^2\theta)$ w.r.t tan θ?

○ A: 2 sec θ
○ B: 2 tan θ
○ C: $\sec^2 \theta$
○ D: $2 \tan\theta \sec^2\theta$

9. Which of the following is not true for function $f(x) = |4 - x^2|$?

○ A: Function value is always positive.
○ B: Function is continuous.
○ C: Function is differentiable at x = +2 and -2.
○ D: Its domain is the set of all real numbers.

10. $\frac{d}{dx}e^{e^x} \; =?$

○ A: $e^x e^{e^x}$
○ B: e^{e^x}
○ C: e^{2x}
○ D: $1/e^x$

11. $\frac{d}{dx} tan^{-1}\sqrt{\frac{1 - cos\,x}{1 + cos\,x}} = ?$

○ A: 1
○ B: 2
○ C: ½
○ D: -1/2

12. Maximum value of (ln x) / x is ?

○ A: 0
○ B: 1
○ C: e
○ D: 1/e

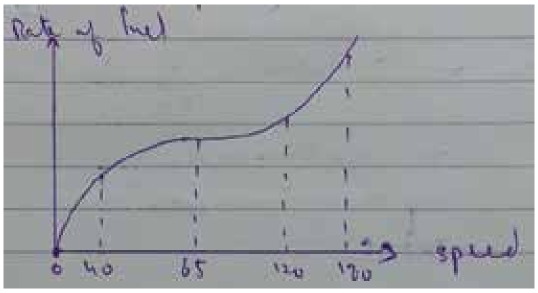
The maximum area of a rectangle of perimeter 176 cm is?

○ A: 1854 cm^2
○ B: 1936 cm^2
○ C: 2110 cm^2
○ D: 3246 cm^2

13. What is the derivative of $(x^3+1)^9$?

○ A: $9(x^3+1)^8$
○ B: $10(x^3+1)^{10}$
○ C: $9x^2 (x^3+1)^8$
○ D: $27x^2 (x^3+1)^8$

14. The graph below shows the rate of fuel consumption with respect to the speed of the car. What is the most efficient speed with repect to the fuel consumption?



○ A: 40
○ B: 65
○ C: 120
○ D: 180

15. Critical point on the graph is the point for which?

○ A: f'(x) = 0
○ B: f'(x) does not exist
○ C: f'(x) = 1
○ D: Both A and B.

16. Derivative of an even function is always ?

○ A: An odd function
○ B: An even function
○ C: Negative function
○ D: Could be even or odd

17. If distance s of an object is given by the function $s=100t - 25t^2$, then what is the velocity at t= 1/2?

○ A: 25
○ B: 50
○ C: 75
○ D: 100

18. $x^2 + y^2 = 4$ is the equation of a circle. What is the slope at a point where x = 0?

○ A: 0
○ B: 2
○ C: 4
○ D: 1/2

19. If y = f(f(x)) ; f(0) = 0 and f'(0) = 1, then y'(0) is equal to ?

○ A: 0
○ B: 1
○ C: 2
○ D: 1/2

TEST 3

1. If $y = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \_\_\_ \infty\right)$, then $\frac{dy}{dx} =$

○ A: 0
○ B: 1
○ C: x
○ D: y

2. **The function $x^3 + x^2 - 5x - 5$ is increasing at which interval?**

○ A: (-infinity , - 5/3]
○ B: [1 , infinity)
○ C: [-5/3 , 1]
○ D: Both A and B.

3. **d/dx cos(cos(cos x))) = ?**

○ A: -sin [cos (cos x)].sin x cos x
○ B: - cos [sin (sin x)] sin x sin x
○ C: -sin [cos (cos x)] sin (cos x) sin x
○ D: sin [cos (cos x)] cos (cos x)

4. $\frac{d}{dx}[\cos^{-1}(4x^3 - 3x)] = ?$

○ A: $\frac{3}{\sqrt{1-x^2}}$
○ B: $\frac{-3}{\sqrt{1-x^2}}$
○ C: $\frac{3}{\sqrt{1+x^2}}$
○ D: $\frac{-3}{\sqrt{1+x^2}}$

5. **y = |cos x| is not differentiable for x = ? (n in the given choices represent a set of integers)**

○ A: nπ/2
○ B: (2n+1) π/2
○ C: nπ
○ D: (n+1) π

6. **If $y = e^{2x + 3 \log x}$, then dy/dx is equal to?**

○ A: $x^2 e^{2x} (2x + 3)$
○ B: $x^2 e^{2x} (2x - 3)$
○ C: $x^3 e^{2x}$
○ D: $x^2 e^{2x} 2x$

7. **If x > 0 and xy = 1, then the minimum value of (x + y) is?**

○ A: -2
○ B: -1
○ C: 1
○ D: 2

8. **The point at which the curve $y = x^3 - 4x + 3$ has gradient 8 is?**

○ A: (2,3)
○ B: (4,5)
○ C: (1,0)
○ D: (0,1)

9. **If x = (cos θ + θ sinθ), y = (sinθ - θ cos θ), then dy/dx is equal to ?**

○ A: tan θ
○ B: cot θ
○ C: sin θ
○ D: cos θ

10. $\frac{d}{dx}\left(tan^{-1}\sqrt{\frac{1+cos\,x}{1-cos\,x}}\right) =?$

○ A: -1
○ B: 1
○ C: ½
○ D: -1/2

11. The graph f(x)=cot x has critical points at which of the following points in the interval [0,π]?

○ A: 0 and π ○ B: 0 and π/2

○ C: π and π/2 ○ D: π/4 and π/2

12. The minimum value of $(x^2 + 250/x) = ?$

○ A: 75 ○ B: 50

○ C: 5 ○ D: The function has no minimum value.

13. tan x is ____ function in the interval [0,π/2]?

○ A: Increasing ○ B: Decreasing

○ C: Constant ○ D: Discontinuous

14. The function $x^3 - 27x + 5$ is increasing when?

○ A: |x| > 3 ○ B: |x| < 3

○ C: x < -3 ○ D: x > 3

15. If $y = \tan^{-1}(\sqrt{1 + x^2} + x)$, then $\frac{dy}{dx} = ?$

○ A: $1 / 2(1+x^2)$ ○ B: $-1 / 2(1+x^2)$

○ C: $1 / 2(1-x^2)$ ○ D: $2 / (1-x^2)$

16. The point on the curve y = √x at which the tangent makes an angle of 45° with x axis is?

○ A: (1,1) ○ B: (1/16,1/4)

○ C: (4,2) ○ D: (1/4, 1/2)

17. If $y = 12x^9 + 13x^7 + 5x^5 + 19$ then which of the following is true?

○ A: $d^5y/dx^5 = 0$ ○ B: $d^7y/dx^7 = 0$

○ C: $d^9y/dx^9 = 0$ ○ D: $d^{10}y/dx^{10} = 0$

18. If x > 0, y > 0 and x + y = 18, then the maximum value of xy is?

○ A: 77 ○ B: 81

○ C: 85 ○ D: 144

19. If √x + √y = √a then dy/dx = ?

○ A: $(y/x)^{1/2}$ ○ B: $(x/y)^{1/2}$

○ C: $-(y/x)^{1/2}$ ○ D: $-(x/y)^{1/2}$

20. Derivative of $a^{\sqrt{x}}$ = ?

○ A: $a^{\sqrt{x}}$ ln a ○ B: $a^{\sqrt{x}}$

○ C: $a^{\sqrt{x}}$ / ln a ○ D: $a^{\sqrt{x}}$ ln a / 2√x

TEST 4

1. **What is $d^{19}y/dx^{19}$ if $y = e^{-x}$?**

○ A: e^{-x} ○ B: $-e^{-x}$

○ C: $19e^{-x}$ ○ D: $-19e^{-x}$

2. **The position of an object is given by $x = 15t - 5t^3$ where x is the position. What is the acceleration of the object when it is momentarily at rest?**

○ A: 0 ○ B: 1

○ C: 15 ○ D: -30

3. **A rectangle has perimeter 100m. Its maximum area would be?**

○ A: 480 m^2 ○ B: 625 m^2

○ C: 690 m^2 ○ D: 765 m^2

4. **The maximum value of function f(x) = sin x cos x is?**

○ A: 1 ○ B: 2

○ C: ½ ○ D: 0

5. **If x = log t and $y = t^2 - 1$, then the value of d^2y/dx^2 at t = 1 is?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. **What is the second derivative of $(3t + 2)^{-2}$ with respect to t?**

○ A: $-6(3t + 2)^{-3}$ ○ B: $6(3t + 2)^{-4}$

○ C: $54(3t + 2)^{-3}$ ○ D: $54(3t + 2)^{-4}$

7. **What is the derivative of sin x w.r.t cos x?**

○ A: cos x ○ B: tan x

○ C: - cot x ○ D: - cos x sin x

8. **d/dx sin x^o = ? (x is in degrees)**

○ A: cos x^o ○ B: x cos x^o

○ C: (- π/180) cos x^o ○ D: (π/180) cos x^o

9. $\frac{d}{dx}e^{ln\, sin\, x^2} \; =?$

○ A: $2x \cos x^2$ ○ B: $x \cos x^2$

○ C: $\cos x^2$ ○ D: $1/\sin x * 2\, e^{\sin x}$

10. **If $d/dx\,(3x^3 + x) = d/dx\,(-3x^2 - 5)$ then x = ?**

○ A: 1 or 2 ○ B: -1/3

○ C: 0 or -1/3 ○ D: 0 or 1

11. **$d(x^x) / dx$ = ?**

○ A: x^x (1 + log x) ○ B: 1 + log x

○ C: log x ○ D: x log x

12. If $y = 3x^2 - 12x + 8$ then the slope of tangent at point (3,-1) is?

○ A: -18 ○ B: 6

○ C: -19 ○ D: 8

13. The curve y = sin (x) with domain = set of all real numbers has how many stationary points?

○ A: Infinite ○ B: 0

○ C: 1 ○ D: 2

14. The derivative of e^x sinx w.r.t. e^x is

○ A: cos x + sin x ○ B: cos x

○ C: sin x ○ D: e^x(sin x + cos x)

15. If $\sin x = \frac{t}{\sqrt{1+t^2}}$, then $\frac{dx}{dt}$ is equal to

○ A: 1 ○ B: $1 / (1+t^2)$

○ C: $1 / (1 - t)^{1/2}$ ○ D: $1 / (1 + t^2)^{1/2}$

16. Differentiating $\ln(x^2 + 2x)$ w.r.t x gives?

○ A: $1 / (x^2+2x)$ ○ B: ln (2x + 2)

○ C: (2x+2) / x ○ D: $(2x+2) / (x^2+2x)$

17. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \ldots \text{to } \infty}}}$, then $\frac{dy}{dx}$ is equal to

○ A: x / (2y - 1) ○ B: x / (2y + 1)

○ C: log x / (2y - 1) ○ D: 1 / x(2y - 1)

18. If $y = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ and $\theta = \tan^{-1}x$, then $\frac{dy}{d\theta} = ?$

○ A: 1 ○ B: 1/2

○ C: -1/2 ○ D: x/2

19. What is the derivative of $(x^2 + 1)(x^3 + 7)$ w.r.t x is?

○ A: $5x^3 + 15x + 14$ ○ B: $5x^4 + 3x^2 + 14x$

○ C: $6x^3$ ○ D: $6x^3 + 7$

20. The graph of function $y = x^3$ has a _____ point at x = 0 ?

○ A: Inflection ○ B: Stationary

○ C: Turning ○ D: Both A & B.

Integration

TEST 1

1. **$\int f(x)g'(x)\,dx = ?$**

○ A: $f(x)g(x) - \int g(x)f'(x)\,dx$
○ B: $f(x)g(x) + \int g(x)f'(x)\,dx$
○ C: $f(x)g(x) - \int g'(x)f(x)\,dx$
○ D: $f(x)g(x) + \int g'(x)f(x)\,dx$

2. **$\int \cot x\,dx = ?$**

○ A: ln |cos x| + c
○ B: ln |sec x| + c
○ C: ln |sin x| + c
○ D: ln |cosec x| + c

3. $\int_0^{3\pi/2} cos(x)dx \ = ?$

○ A: 0
○ B: 1
○ C: 3
○ D: -1

4. $\int \frac{\tan\sqrt{x}}{\sqrt{x}}\,dx =$

○ A: ln |cos √x|
○ B: 2 ln |cos √x|
○ C: ln |sec √x|
○ D: 2 ln |sec √x|

5. **The solution of the differential equation dy/dx = 2xy is?**

○ A: $y = ce^{-x^2}$
○ B: $y = ce^{x^2}$
○ C: $y^2 = 2x^2 + c$
○ D: None of the above.

6. $\int_0^{\pi} sin(x)dx \ = ?$

○ A: 0
○ B: 1
○ C: 2
○ D: √2

7. **$\int (3x^2 - 2x + 1)\,dx = ?$**

○ A: $x^3 - x^2 + 1 + c$
○ B: $x^3 - x + 1 + c$
○ C: $x^3 - x^2 + x + c$
○ D: $x^3 + x^2 + x + c$

$\int \sec x \tan x\,dx = ?$

○ A: tan x + c
○ B: cot x + c
○ C: cosec x + c
○ D: sec x + c

8. $\int_{-2}^{3} x^2dx \ = ?$

○ A: 8/3
○ B: 19/3
○ C: 28/3
○ D: 35/3

9. If $f(x) = x^2$ then find dy when x = 3 and dx = 0.01?

○ A: 0.02 ○ B: 0.04

○ C: 0.06 ○ D: 0.08

10. $\int tan^2 x\, dx \ =?$

○ A: $2 \tan x \sec^2 x + c$ ○ B: $\tan x + x + c$

○ C: $\tan x - x + c$ ○ D: None of the above.

11. $\int [f(x)]^{-1} f'(x)dx = ?$ (f(x) > 0)

○ A: $f(x) + c$ ○ B: $\ln | \ln f(x) | +c$

○ C: $\ln f(x) + c$ ○ D: $[f(x)]^{n+1} / (n+1)$

12. $\int_1^2 (2x^5 - x + 3)dx \ =?$

○ A: 45/2 ○ B: 39/2

○ C: 17/2 ○ D: None of the above.

13. $\int dx/(ax + b) =?$

○ A: $\ln|ax + b| + c$ ○ B: $1/a \ln|ax + b| + c$

○ C: $1/b \ln|ax + b| + c$ ○ D: $1/a \ln|a| + c$

14. Which of the following mathematical function gives the area under the curve?

○ A: Differentiation ○ B: Integration

○ C: Vector product ○ D: Both B and C.

15. $\int x\, sinx\, dx \ =?$

○ A: $x \sin x + \cos x + c$ ○ B: $- x \sin x + \cos x + c$

○ C: $x \cos x + \sin x + c$ ○ D: $- x \cos x + \sin x + c$

16. $\int \frac{x}{(1+x^4)} dx =$

○ A: $\tan^{-1} x^2 + c$ ○ B: $1/2 \tan^{-1} x^2 + c$

○ C: $\cot^{-1} x^2 + c$ ○ D: $1/2 \cot^{-1} x^2 + c$

17. $\int (2x + 3)^{1/2} dx = ?$

○ A: $1/3\ (2x + 3)^{3/2} + c$ ○ B: $1/2\ (2x + 3)^{3/2} + c$

○ C: $1/3\ (2x + 3)^{1/2} + c$ ○ D: $2/3\ (2x + 3)^{3/2} + c$

18. $\int \tan x \sec^2 x\, dx = ?$

○ A: $\sec^2 x / 2 + c$ ○ B: $\tan^2 x / 2 + c$

○ C: $\tan^2 x$ ○ D: $1/2 (\cos x)^2$

19. What is the solution of the equation?

(sin y) (cosec x) dy/dx = 1

○ A: sin y = sin x + c ○ B: sin y = - sin x + c

○ C: cos y = cos x + c ○ D: cos y = - cos x + c

TEST 2

1. $\int \frac{1-x^2}{1+x^2}dx$ **= ?**

○ A: $x + \mathrm{Tan}^{-1} x + c$
○ B: $x - \mathrm{Tan}^{-1} x + c$
○ C: $-x + 2\mathrm{Tan}^{-1} x + c$
○ D: $-x - 2\mathrm{Tan}^{-1} x + c$

2. $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx \;\; =?$

○ A: 20/3
○ B: 14/3
○ C: 8/3
○ D: 5/3

3. The family of curve $y = Ax + A^3$ is represented by the differential equation of degree?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

4. $\int \frac{\cos x - \sin x}{\cos x + \sin x}dx \;\; =?$

○ A: - ln (cos x - sin x) + c
○ B: - ln (cos x + sin x) + c
○ C: ln (cos x - sin x) + c
○ D: ln (cos x + sin x) + c

5. $\int \frac{\cos x}{\sqrt{1 + \sin x}}dx = ?$

○ A: $-(1+\sin x)^{1/2} + c$
○ B: $2(1+\sin x)^{1/2} + c$
○ C: $0.5\,(1+\sin x)^{1/2} + c$
○ D: $-0.5\,(1+\sin x)^{1/2} + c$

6. $\int a^{\lambda x + y}\,dx$ **=?**

○ A: $1/(\lambda \ln a)\, a^{\lambda x + y} + c$
○ B: $1/(\ln a)\, a^{\lambda x + y} + c$
○ C: $1/(\lambda \ln a)\, a^{x + y} + c$
○ D: $1/(\ln a)\, a^{x + y} + c$

7. The order of a differential equation whose solution is y = a cos x + b sin x, where a and b are arbitrary constants, is?

○ A: 1
○ B: 2
○ C: 3
○ D: Cannot be determined.

8. $\int x \ln x\, dx = ?$

○ A: $0.5\, x^2 (\ln x - 0.5) + c$
○ B: $x^2 (\ln x + 0.5) + c$
○ C: $1.5\, x (\ln x + 1) + c$
○ D: $x^2 (\ln x - x) + c$

9. The order and the degree of the differential equation $d^2s/dt^2 + 4 = 0$ are?

○ A: Order is 2 and degree is 2
○ B: Order is 2 and degree is 3
○ C: Order is 1 and degree is 2
○ D: None of the above.

10. $\int \ln (\tan x) \sec^2 x\, dx = ?$

○ A: ln (tan x) + tan x + c
○ B: tan x ln (tan x) - tan x + c
○ C: ln (tan x) - sec x + c
○ D: tan x ln (tan x) + tan x + c

11. $\int \frac{1-\tan^2 x}{1+\tan^2 x}\,dx =$

○ A: sin 2x
○ B: 1/2 sin 2x
○ C: cos 2x
○ D: 1/2 cos 2x

12. The solution of the differential equation $\frac{dy}{dx} + \frac{1+\cos 2y}{1-\cos 2x} = 0$ is

○ A: tan y + cot x = c
○ B: tan y . cot x = c
○ C: tan y - cot x = c
○ D: tan y = c . cot x

13. Which of the following is an ordinary differential equation?

○ A: $2y + 8x = \frac{d(cosx)}{dx}$
○ B: $\frac{d(y+x)}{dx} = x^2 + sin\,x$
○ C: $\frac{d(cos\,x + tan\,x)}{dx} = x + 2y$
○ D: All of the above.

14. ∫ $\sec^2$x cosec^2x dx = ?

○ A: tan x cot x
○ B: tan x + cot x
○ C: tan x - cot x
○ D: - tan x cot x

15. ∫ $\tan^2$ x dx = ?

○ A: tan x + x + c
○ B: tan x - x + c
○ C: $\sec^2$ x - x + c
○ D: cosec^2 x + x + c

16. $\int \frac{1}{(1+x^2)Tan^{-1}x}dx \;\; =?$

○ A: 1/x ln |Tan^{-1} x| + c
○ B: -1/x ln |Tan^{-1} x| + c
○ C: - ln |Tan^{-1} x| + c
○ D: ln |Tan^{-1} x| + c

17. The solution of the differential equation y dy/dx = x - 1, satisfying x = 1 and y = 1, is?

○ A: $y^2 = 2x^2 - x - 1$
○ B: $y^2 = x^2 - 2x + 2$
○ C: $y = x^2 - 2x + 3$
○ D: $y^2 = 2x^2 - x - 3$

18. $\int ln\,x\,dx \;\; =?$

○ A: x (1 – ln x) + C
○ B: x (ln x - 1) + C
○ C: (1 + x) ln x + C
○ D: (1 - x) ln x + C

19. A particle moves in a straight line with a velocity given by dx/dt = x + 1 (x is the distance described). The time taken by a particle to traverse a distance of 99 meters is?

○ A: log 10e
○ B: 2 $\log_e$ 10
○ C: 2 log 10 e
○ D: 0.05 log10 e

20. The number of arbitrary constants in the second order differential euqation is?

○ A: 0
○ B: 1
○ C: 2
○ D: Infinite

TEST 3

1. $\displaystyle\int \frac{cos2x - 1}{1 + cos2x}dx \ \ =?$

○ A: $- \tan x + x + c$

○ B: $\tan x + x + c$

○ C: $x - \sec x + c$

○ D: $x + \sec x + c$

2. $\displaystyle\int e^{-ln\, x}\, dx \ \ =?$

○ A: $e^{-\ln x}$

○ B: $\ln |x|$

○ C: $-e^{-\ln x}$

○ D: $-x\, e^{-\ln x}$

3. $\displaystyle\int_0^1 \frac{dx}{(1 + x^2)^{3/2}} \ \ =?$

○ A: 1

○ B: $\sqrt{2}$

○ C: $1/\sqrt{2}$

○ D: $3/\sqrt{2}$

4. The solution of the equation $(e^x + 1)y\,dy = (y + 1)e^x\,dx$ is ?

○ A: $y = e^x(e^x + 1) + C$

○ B: $(y + 1) = e^{2x} + C$

○ C: $y = e^x / x + C$

○ D: $C\,(1 + y)(1 + e^x) = e^y$

5. The differential equation of all circles of radius 'r' is of order?

○ A: 1

○ B: 2

○ C: 3

○ D: 4

6. What is the solution of the differential equation,

$$(x\sqrt{1 + y^2})dx + (y\sqrt{1 + x^2})dy = 0$$

○ A: $(1+y^2)^{1/2} + (1 + x^2)^{1/2} = c$

○ B: $\log\,(1 + y^2) + \log\,(\,1 + x^2) = 2c$

○ C: $\sin^{-1} y + \sin^{-1} x = c$

○ D: $\tan^{-1} y + \tan^{-1} x = c$

7. $\displaystyle\int \frac{e^{tan^{-1}x}dx}{1 + x^2}$ **= ?**

○ A: $xe^{tan^{-1}x} + c$

○ B: $(tan^{-1}x)e^{tan^{-1}x} + c$

○ C: $tan^{-1}x + c$

○ D: $e^{tan^{-1}x} + c$

8. $\displaystyle\int_0^{2\pi} cos^2\theta\, d\theta \ \ =?$

○ A: π

○ B: 2π

○ C: $3\pi/2$

○ D: 3

9. $\displaystyle\int_0^{\pi} \sqrt{1 + sin\ x}\, dx \ \ =?$

○ A: 2

○ B: 4

○ C: $\sqrt{2}$

○ D: $2\sqrt{2}$

10. $\int |x|\, dx = ?$

○ A: $x^2 / 2$

○ B: $- x^2 / 2$

○ C: $x |x| / 2$

○ D: 1

11. $\int \frac{\sec x \ \mathrm{cosec}\ x}{\log \tan x} dx =$

○ A: log [log tan x] + C

○ B: cot (log x) + C

○ C: tan (log x) + C

○ D: None of the above.

12. If $\int x^6 \sin(5x^7) dx = \frac{k}{5} \cos(5x^7),\ x \neq 0$, then

○ A: k = -1/7

○ B: k = 1/7

○ C: k = -7

○ D: k = 7

13. $\int \frac{dx}{e^x + e^{-x}} \ =?$

○ A: $\log (e^x + 1) + C$

○ B: $\log (e^x + e^{-x}) + C$

○ C: $\tan^{-1} e^x + C$

○ D: $\sin^{-1} e^x + C$

14. The value of $\int \frac{(x - x^3)^{1/3}}{x^4} dx$ is

○ A: $(3/8)\,(1/x^2 - 1)^{4/3} + C$

○ B: $- (3/8)\,[(1/x^2) - 1]^{4/3} + C$

○ C: $(1/8)\,(1 - 1/x^2)^{4/3} + C$

○ D: $- (1/8)\,(1 - 1/x^2)^{4/3} + C$

15. $\int \frac{\cos x}{\sin x \,.\, \ln \sin x} dx \ =?$

○ A: - ln |ln sin x| dx

○ B: - ln |ln cos x| dx

○ C: ln |ln sin x| dx

○ D: ln |ln cos x| dx

16. $\int_0^{2\pi} \sqrt{1 + \sin(x/2)}\, dx \ =?$

○ A: 2

○ B: 4

○ C: 8

○ D: 0

17. $\int \sin^{-1} x\, dx \ =?$

○ A: $x \cos^{-1} x + (1 - x^2)^{1/2} + C$

○ B: $x \sin^{-1} x + C$

○ C: $x \sin^{-1} x + (1 - x^2)^{1/2} + C$

○ D: $- \sin^{-1} x + (1 - x^2)^{1/2} + C$

18. $\int_0^{\pi/2} \sin x \, e^{\cos x} dx \ =?$

○ A: 1

○ B: e - 1

○ C: e

○ D: -1

19. $\int \frac{xe^x}{(1+x)^2}dx \ =?$

○ A: $(1 + 2x\, e^x) / (1 + x)$
○ B: $(1 - 2x\, e^x) / (1 + x)$
○ C: $- e^x / (1+x)$
○ D: $e^x / (1+x)$

20. The equation of the curve through the point (1, 0) and whose slope is $\frac{y-1}{x^2 - x}$ is

○ A: $(y - 1)(x + 1) + 2x = 0$
○ B: $2x(y - 1) + x + 1 = 0$
○ C: $x(y - 1)(x + 1) + 2 = 0$
○ D: $y(y - 1)(x - 1) + 2 = 0$

TEST 4

1. $\int \sqrt{1 + cos(x/4)}\, dx \ =?$

○ A: $8 \sqrt{2} \sin (x/8) + C$
○ B: $- 8 \sqrt{2} \sin (x/8) + C$
○ C: $8 \sqrt{2} \cos (x/8) + C$
○ D: $- 8 \sqrt{2} \cos (x/8) + C$

2. $\int_0^{\pi/2} sin^2 x\, dx \ =?$

○ A: π
○ B: π/2
○ C: π/3
○ D: π/4

3. $\int_0^{\pi} \sqrt{1 - cos\, x}\, dx \ =?$

○ A: 1
○ B: $\sqrt{2}$
○ C: $2\sqrt{2}$
○ D: 2

4. $\int_0^{\pi/2} sin(x) sin(2x) dx \ =?$

○ A: 1/3
○ B: 2/3
○ C: 1
○ D: pi

5. Which of the following statement is false?

○ A: The degree of the differential equation is the highest power of the highest order differential coefficient occurring in it.
○ B: The order of the differential equation is the highest order derivative occurring in the equation.
○ C: The order of a differential equation is unique.
○ D: The order of a differential equation is any integer.

6. $\int \cos \sqrt{x}\, dx = ?$

○ A: $[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$
○ B: $2[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$
○ C: $[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$
○ D: $2[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$

7. The differential equation $x\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y = x^2$ is of

○ A: Degree 4 and order 2
○ B: Degree 4 and order 3
○ C: Degree 3 and order 2
○ D: Degree 2 and order 3

8. What is the solution of the differential equation?

$x\,dy + y(x - 1)dx = 0$

○ A: $y = c\,xe^{x}$
○ B: $y = c\,xe^{-x}$
○ C: $y = c\,e^{-x}$
○ D: $y = c\,xe^{x+1}$

9. $\int [f(x)]^n f'(x)\,dx = ?$

○ A: $\ln f(x) + c$
○ B: $- \ln f(x) + c$
○ C: $[f(x)]^{n+1} / (n+1)$
○ D: $[f(x)]^{n} / (n+1)$

10. $\int x^2 e^{x^3} \cos(e^{x^3})dx$ is equal to

○ A: $\frac{1}{3}sin(e^{x^3}) + c$
○ B: $sin(e^{x^3}) + c$
○ C: $3sin(e^{x^3}) + c$
○ D: $-sin(e^{x^3}) + c$

11. If $dr/dt = - rt$ and $r(0) = r_0$, then which of the following is correct?

○ A: $r = r_o e^{-t}$
○ B: $r = r_o e^{-t/2}$
○ C: $r = r_o e^{-t.t}$
○ D: $r = r_o e^{-t.t/2}$

12. $\int \frac{e^{2x} + e^{x}}{e^{x}} dx \;\; =?$

○ A: $e^{x} + 1 + c$
○ B: $2x\,e^{x} + c$
○ C: $e^{2x} + 1 + c$
○ D: $e^{x} + x + c$

13. δy for any function f(x) is given by?

○ A: $f(\delta x)$
○ B: $f(x + \delta x)$
○ C: $f(x + \delta x) + f(x)$
○ D: $f(x + \delta x) - f(x)$

14. $\int_0^{\pi/2} cos^2x\,dx \;\; =?$

○ A: π
○ B: $\pi/2$
○ C: $\pi/3$
○ D: $\pi/4$

15. The solution of the equation $y\,dx + x\,dy = 0$ is?

○ A: $xy = c$
○ B: $x/y = c$
○ C: $x + y = c$
○ D: $x - y = c$

Analytic Geometry

TEST 1

1. **Equation of a line parallel to x axis at a distance 'a' below the x axis is?**

○ A: $x = a$
○ B: $x = - a$
○ C: $y = - a$
○ D: $y = a$

2. **What is the equation of a line perpendicular to a line with slope = -6? The line has y intercept of 4/3.**

○ A: $y = x + 8$
○ B: $y = -6x + 4/3$
○ C: $6y = x + 8$
○ D: $y = x + 3/4$

3. **The angle bisectors of a triangle are?**

○ A: Perpendicular
○ B: Concurrent
○ C: Non-concurrent
○ D: Parallel

4. **The equation of family of lines perpendicular to line $3x + 4y + 7 = 0$, is?**

○ A: $4x + 3y + k = 0$
○ B: $4x - 3y + k = 0$
○ C: $3x - 4y + k = 0$
○ D: $3x + 4y + k = 0$

5. **If m_1 and m_2 are the slopes of the perpendicular lines. Which of the following is true?**

○ A: $m_1 = m$
○ B: $m_1 = - m_2$
○ C: $m_1m_2 -1 = 0$
○ D: $m_1m_2 +1 = 0$

6. **Angle between lines $2x^2 - 7xy + 3y^2 = 0$, is?**

○ A: 45°
○ B: 60°
○ C: 90°
○ D: 30°

7. **What is the distance between the points A (7,5) and B (2,-6) ?**

○ A: $\sqrt{73}$
○ B: $\sqrt{146}$
○ C: $\sqrt{183}$
○ D: $\sqrt{219}$

8. **Equation of x axis is?**

○ A: $y = 0$
○ B: $x = 0$
○ C: $x = y$
○ D: $y = 1$

9. **What is the y intercept of the line $x - \sqrt{3}y + 10 = 0$**

○ A: $10/\sqrt{3}$
○ B: $-10/\sqrt{3}$
○ C: 10
○ D: -10

10. **The mid point of line joining points A (3 ,1) and B(-2,-4) is?**

○ A: (5/2 , 5/2)
○ B: (3/2, 1/2)
○ C: (-1, -2)
○ D: (1/2 , -3/2)

11. **If inclination of a line is 45° then the slope is?**

○ A: 0
○ B: 1
○ C: -1
○ D: Infinity.

12. The point (-4,-2) lies on a circle. What is the length of the radius of this circle if the center is located at (-8,-10)?

○ A: $\sqrt{47}$
○ B: $\sqrt{80}$
○ C: $\sqrt{95}$
○ D: $\sqrt{108}$

13. If two medians of a triangle ABC pass through point (1,-2) then the third median pass through?

○ A: (0,0)
○ B: (-2,1)
○ C: (-1,-2)
○ D: None of the above.

14. Which of the following statement is true about any triangle?

○ A: Altitudes and right bisectors are concurrent.
○ B: Altitudes and right bisectors are non-concurrent.
○ C: Altitudes are concurrent and right bisectors are not concurrent.
○ D: Altitudes are not concurrent and right bisectors are concurrent.

15. If m_1 and m_2 are the slopes of two lines then the tangent of angle between the lines is equal to?

○ A: $(m_2 - m_1) / (1 - m_1m_2)$
○ B: $(m_2 + m_1) / (1+m_1m_2)$
○ C: $(m_2 + m_1) / (1 - m_1m_2)$
○ D: $(m_2 - m_1) / (1+m_1m_2)$

16. In the straight equation $x \cos a + y \sin a = P$, P represents?

○ A: Y intercept
○ B: X intercept
○ C: Mid point of the line.
○ D: Length of perpendicular from the origin to the line

17. What is the point of intersection for $5x + 7y = 35$ and $3x - 7y = 21$?

○ A: (5,7)
○ B: (7,0)
○ C: (3,-7)
○ D: (4,3)

18. If points A(a,b) ; B(c,d) and C(e,f) are collinear. Then the area of the triangle ABC is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

19. The point p (x,y) such that $x>0$ and $y<0$ lies in?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

20. What is the slope of the line $ax + by + c = 0$?

○ A: 0
○ B: Infinite
○ C: -c/b
○ D: -a/b

TEST 2

1. **What is the symmetric form of the equation 5x - 12y + 39 = 0?**
   - ○ A: $\frac{x+39/5}{12/13} = \frac{y}{5/13}$
   - ○ B: $(-5/13)x + (12/13)y = 3$
   - ○ C: $(-5/39)x + (12/39)y = 1$
   - ○ D: $y = (5/12)x + (39/12)$

2. **The equation of line parallel to x-axis and bisecting the join of (1, 4) and (− 2, 6) is?**
   - ○ A: $y = 3$
   - ○ B: $y = 5$
   - ○ C: $y + 2 = 5$
   - ○ D: $x = 5$

3. **What is the equation of a line passing through the point (4,2) and parallel to the line connecting points (0,-1) and (7,-15)?**
   - ○ A: $y + 2x + 10 = 0$
   - ○ B: $y + 2x - 10 = 0$
   - ○ C: $2y + 3x - 7 = 0$
   - ○ D: $2y + 3x + 7 = 0$

4. **The two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if?**
   - ○ A: $a_1b_2 - a_2b_1 = 0$
   - ○ B: $a_1a_2 - b_1b_2 = 0$
   - ○ C: $a_1b_2 + a_2b_1 = 0$
   - ○ D: $a_1a_2 + b_1b_2 = 0$

5. **The three lines $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if and only if?**
   - ○ A: $a_1 = a_2 = a_3$ and $b_1 = b_2 = b_3$ and $c_1 = c_2 = c_3$
   - ○ B: $a_1 + b_1 + c_1 = 0$
   - ○ C:
   - ○ D:

6. **If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then?**
   - ○ A: a = 0, b = 4
   - ○ B: a = 3, b = 4
   - ○ C: a = 2, b = 3
   - ○ D: a = 3, b = 5

7. **The equation of general form $ax^2 + 2hxy + by^2$ represents?**
   - ○ A: A line
   - ○ B: A curve
   - ○ C: A pair of lines
   - ○ D: A pair of lines through the origin

8. **Centroid of a triangle divides each median in the ratio?**
   - ○ A: 1:1
   - ○ B: 1:2
   - ○ C: 2:1
   - ○ D: 1:3

9. **Find the radius of a circle whose diameter has endpoints (-3, -2) and (7, 8)?**
   - ○ A: $10\sqrt{2}$
   - ○ B: $2\sqrt{10}$
   - ○ C: $5\sqrt{2}$
   - ○ D: $2\sqrt{5}$

10. **The angle between the pair of lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$ is?**
    - ○ A: None of the above.
    - ○ B: $\tan^{-1}(4/3)$
    - ○ C: $\tan^{-1}(11/3)$
    - ○ D: $\tan^{-1}(7/3)$

11. Of $P_1(x_1,y_1)$ and $P_2=(x_2,y_2)$ are two points such that line joining P_1P_2 is parallel to x axis then?

○ A: $x_1 = x_2$ ○ B: $y_1 = x_2$

○ C: $x_1 = y_2$ ○ D: $y_1 = y_2$

12. The equation of a straight line that intersects x axis at point 2 and y axis at point -4 is?

○ A: $y - 2x + 4 = 0$ ○ B: $y - 2x - 4 = 0$

○ C: $2x - y + 4 = 0$ ○ D: $x - 2y + 4 = 0$

13. For a pair of lines represented by general equation $ax^2 + 2hxy + by^2$, if $h^2 > ab$ then?

○ A: Lines are real and distinct. ○ B: Lines are real and coincident.

○ C: Lines are imaginary. ○ D: Lines do not pass through the origin.

14. What is the equation of the line intersecting $3x - 4y - 10 = 0$ and $x + 2y - 10 = 0$ and having a zero slope?

○ A: $2x + 3y - 18 = 0$ ○ B: $y = 2$

○ C: $x = 9$ ○ D: $2x + 3y + 18 = 0$

15. Slope of a line is negative if the angle z it froms with the x axis is?

○ A: $z = 0$ ○ B: $z > 90$

○ C: $0 < z < 90$ ○ D: $90 < z < 180$

16. If three points A(a,b), B(c,d) and C(e,f) are collinear then?

○ A: Slope of AB is not equal to the slope of BC

○ B: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$ ○ C: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 1$

○ D: None of the above.

17. The equation below shows which form of the straight line equation?

$$\frac{x - x_1}{cos\,\alpha} = \frac{y - y_1}{sin\,\alpha}$$

○ A: Normal form ○ B: Two point form

○ C: Symmetric form ○ D: Point slope form

18. What is the distance between two parallel lines $2x - 5y + 13 = 0$ and $2x - 5y + 6 = 0$?

○ A: 3/28 ○ B: 9/32

○ C: $7/\sqrt{29}$ ○ D: $4/\sqrt{63}$

19. What is the normal form of the straight line equation $5x - 12y + 39 = 0$?

○ A: This equation cannot be represented in the two point form.

○ B: $y = (5/12)\,x + 39/12$ ○ C: $(-5/39)\,x + (12/39)\,y = 1$

○ D: $(-5/13)\,x + (12/13)\,y = 3$

20. The points of line $|x| = |y|$ may lie in which quadrant?

○ A: Quadrant I ○ B: Quadrant I & III

○ C: Quadrant II and IV ○ D: Quadrant I, II , III or IV

TEST 3

1. **Find the value of k in the equation (3x - 4y - 10) + k(x + 2y - 10) = 0 such that the line is perpendicular to a line with slope 3/4?**

○ A: 4 ○ B: 5

○ C: 6 ○ D: 7

2. **The pair of lines represented by the equation $2x^2 + 49xy - 2y^2$are?**

○ A: Imaginary. ○ B: Parallel

○ C: Perpendicular ○ D: None of the above.

3. **The straight lines given below form what kind of triangle?**

$x + y - 4 = 0$, $3x + y - 4 = 0$, $x + 3y - 4 = 0$

○ A: Isoceles ○ B: Equlateral

○ C: Right angled ○ D: None of the above.

4. **Pair of lines represented by the equation $2x^2 + 8xy + 8y^2$ are?**

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imginary. ○ D: None of the above.

5. **What is the value of h such that points (-1,h) , (3,2) and (7,3) are collinear?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. **The lines px + qy + r = 0, qx + ry + p = 0, rx + py + q = 0 are concurrent if?**

○ A: $p + q + r = 0$ ○ B: $p^2 + q^2 + r^2 + pq + qr + rp = 0$

○ C: $p^2 + q^2 + r^2 + 3pqr = 0$ ○ D: All of the above.

7. **The equation of base of an equilateral triangle is x + y = 2 and the vertex opposite to this base is (2, − 1). Then the length of the side of triangle equals?**

○ A: √3 ○ B: √1 / √3

○ C: √2 / √3 ○ D: √3 / √2

8. **For a pair of Imaginary lines represented by the equation $ax^2 + 2hxy + by^2$. Which of the following is true?**

○ A: The imaginary lines never intersect.

○ B: They intersect at (0,0) ○ C: They intersect at postivie y axis.

○ D: They intersect at negative y axis.

9. **If vertices of triangle ABC are A(2,2), B(-4,-4) and C(5,-8). Then the length of median through C is?**

○ A: √65 ○ B: √75

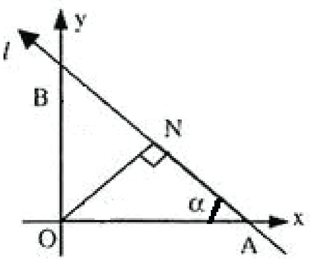
○ C: √85 ○ D: √95

10. **For a pair of lines represented by the equation $3x^2 + 4xy + 9y^2$, the lines are?**

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imaginary. ○ D: Not passing through the origin.

11. What the equation of a line at a distance 5 units from the origin, having angle $\alpha = 30^o$ as shown in the figure below?



○ A: $\sqrt{3}x + y = 10$ ○ B: $x + \sqrt{3}y = 10$

○ C: $\sqrt{3}x + y = 5$ ○ D: $x + \sqrt{3}y = 5$

12. Which of the following is true about the two points (0,0) and (-4,7) with respect to the line $2x - 3y + 6 = 0$?

○ A: They both lie on the line. ○ B: They both lie above the line.

○ C: They both lie below the line. ○ D: They lie on the opposite sides of the line.

13. What is the radius of circle inscribed in the triangle formed by lines $x = 0$, $y = 0$ and $4x + 3y - 24 = 0$?

○ A: 2 ○ B: $2\sqrt{2}$

○ C: 3 ○ D: 4

14. Equation of the right bisector of the line segment joining points (7,4) and (-1,-2) is?

○ A: $4x + 3y - 10 = 0$ ○ B: $4x + 3y - 15 = 0$

○ C: $3x - 4y + 7 = 0$ ○ D: $3x - 4y - 7 = 0$

15. The line segment joining the point (-3,-4) and (1,-2) is divided by the y axis in ratio?

○ A: 1:1 ○ B: 2:1

○ C: 3:1 ○ D: 4:1

16. If the coordinates of the mid point of the triangle are (1,-1), (2,3) and (3,2) then the area of triangle is?

○ A: 3/2 ○ B: 9/2

○ C: 6 ○ D: 11/2

17. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form which of the following triangles?

○ A: Isoceles ○ B: Equilateral

○ C: Right Angled ○ D: None of the above.

18. Points A(1, 3) and C(5, 1) are opposite vertices of a rectangle ABCD. If the slope of BD is 2, then its equation is

○ A: $2x - y = 4$ ○ B: $2x + y = 4$

○ C: $2x + y = 7$ ○ D: $2x - y = -7$

19. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product then c has the value?

○ A: -1 ○ B: 1

○ C: -2 ○ D: 2

20. Equation of the line passing through the point (1,-2) and cutting off equal intercepts from the axis would be?

○ A: x + y = 1
○ B: x + y + 1 = 0
○ C: x - y = 1
○ D: x - y + 1 = 0

TEST 4

1. For a pair of lines represented by the equation $ax^2 + 2hxy + by^2$, which of the following is true if the lines are parallel?

○ A: $h^2 = 0$
○ B: $h^2 > ab$
○ C: $h^2 < ab$
○ D: $h^2 - ab = 0$

2. If point A (-1,2) is the center of a circle and point B (7,5) lies on the circle. The diameter of circle is?

○ A: 9
○ B: √45.
○ C: √73.
○ D: 2√73

3. The coordinate axis is changed through the point O' (2,3). If coordinates of a point P in new axis are (-1,4) then the original coordinates of P were?

○ A: (0,0)
○ B: (2,3)
○ C: (1,7)
○ D: (3,-1)

4. The point P (x,y) with x<0 and y<0 lies in which quadrant?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

5. What are the new coordinates of the point P(5,3), if the axis is rotated by angle 45°?

○ A: (4,2)
○ B: (√2, 2√2)
○ C: (2√2, -√2)
○ D: (4√2, -√2)

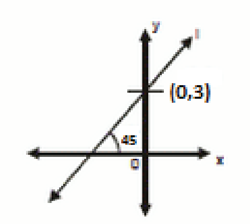
6. Inclination of the line y = -x is?

○ A: 45°
○ B: 135°
○ C: 225°
○ D: 315°

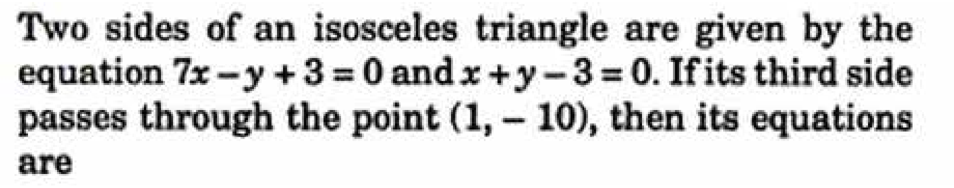
7. What is the angle between the lines L_1 joining points (1,-7) and (6,-4) and L_2 joining points (-1,2) and (-6,-1)?

○ A: 0
○ B: 30
○ C: 45
○ D: 60

8. The equation of the line given below is?



○ A: y = 3x -1
○ B: y = 3x + 1
○ C: y + x = 3
○ D: y = x + 3

9. 

Two sides of an isosceles triangle are given by the equation $7x - y + 3 = 0$ and $x + y - 3 = 0$. If its third side passes through the point (1, – 10), then its equations are

○ A: x - 3y - 31 = 0 or 3x + y + 7 = 0 ○ B: x - y - 31 = 0 or x + y + 7 = 0

○ C: 2x - 3y - 11 = 0 or x + 4y + 9 = 0 ○ D: x + y + 1 = 0 or 5x - y + 10 = 0

10. Equation of the line through the point (2,3) and perpendicular to the line joining (-5,6) and (-6,5) is given by?

○ A: x - y + 5 = 0 ○ B: x + y + 5 = 0

○ C: x - y - 5 = 0 ○ D: x + y - 5 = 0

11. The extremities of diagonal of a parallelogram are the points (3, − 4) and (− 6, 5). If the third vertex is (− 2, 1), then the fourth vertex will be?

○ A: (0,1) ○ B: (1,0)

○ C: (1,1) ○ D: (-1,0)

12. Orthocenter of a triangle is defined as the point of intersection of?

○ A: Altitudes ○ B: Angle bisectors

○ C: Medians ○ D: None of the above.

13. If the lines represented by equation $Ax^2 + 2Hxy + By^2 = 0$ are perpendicular, then?

○ A: A + H = 0 ○ B: A + B = 0

○ C: H = 0 ○ D: A/B = H/B

14. What is the equation of the lines passing through the point (-5,-3) and (9,-1) ?

○ A: x - 7y - 16 = 0 ○ B: x - 7y + 16 = 0

○ C: x + 7y + 16 = 0 ○ D: x + 7y - 20 = 0

15. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. Then PQRS must be a?

○ A: General parallelogram ○ B: Rectangle

○ C: Rhombus ○ D: None of the above.

16. A line passes through point (4, 1) and is perpendicular to line 3x + y = 3, then its x − intercept is?

○ A: ½ ○ B: 2/3

○ C: 1 ○ D: 3/2

17. The line passing through point (1,2) and perpendicular to x + y + 1 = 0 is?

○ A: y - x + 1 = 0 ○ B: y - x - 1 = 0

○ C: y - x + 2 = 0 ○ D: y - x - 2 = 0

18. Distance between two lines defined by x + 3 = 0 and x - 3 = 0 is?

○ A: 0 ○ B: 3

○ C: 6 ○ D: 9

19. M is the midpoint of line AB. The coordinates of A are (-2,3) and the coordinates of M are (1,0). The coordinates of B are?

○ A: (-1/2,3/2)
○ B: (4,-3)
○ C: (4,6)
○ D: (-4,-3)

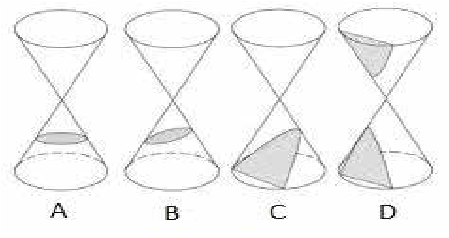
20. If a line passing through the points (x_1, y_1) and (x_2, y_2) such that $x_1 = x_2$ then the slope of the line is?

○ A: Zero
○ B: Positive
○ C: Negative
○ D: Undefined

Conic Sections

TEST 1

1. **Which of the following cutting of a cone represents a circle?**



○ A: A
○ B: B
○ C: C
○ D: D

2. **Eccentricity of ellipse is?**

○ A: Equal to 1.
○ B: Greater than zero and less than 1.
○ C: Greater than one.
○ D: Zero

3. **Center and radius of the circle represented by $x^2 + y^2 = 9$ is?**

○ A: (1,1) and 9
○ B: (1,1) and 3
○ C: (0,0) and 9
○ D: (0,0) and 3

4. **Equation of a circle cannot have a term?**

○ A: x
○ B: y
○ C: xy
○ D: All of the above.

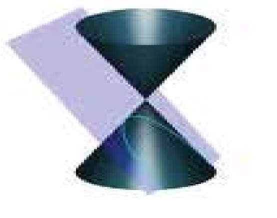
5. **The center of the circle represented by the equation $(x - 3)^2 + (y + 4)^2 = 4$ is?**

○ A: (3,4)
○ B: (-3,-4)
○ C: (-3,4)
○ D: (3,-4)

6. **What is the focus of the ellipse $x^2/16 + y^2/4 = 1$?**

○ A: $(\pm 2\sqrt{3}, 0)$
○ B: $(\pm \sqrt{3}, 0)$.
○ C: $(\pm 2\sqrt{5}, 0)$.
○ D: $(\pm \sqrt{5}, 0)$.

7. **The plane cutting a double cone as shown in the figure below would get a/an?**

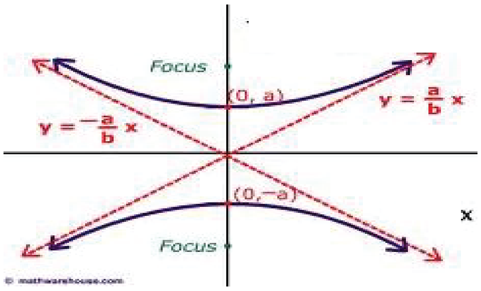


○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

8. **The equation $x^2/a^2 + y^2/b^2 = 1$ represents a verticle ellipse if?**

○ A: $a^2 = b^2$
○ B: $a^2 < b^2$
○ C: $a^2 > b^2$
○ D: None of the above.

9. The equation of the given hyperbola is of form?



○ A: $x^2/a^2 + y^2/b^2 = 1$

○ B: $x^2/b^2 + y^2/a^2 = 1$

○ C: $x^2/a^2 - y^2/b^2 = 1$

○ D: $y^2/a^2 - x^2/b^2 = 1$

10. When the cutting of a conic section is parallel to the axis of the cone and intersects both nappes, it represents a/an?

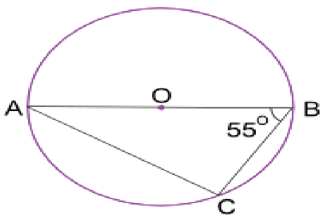
○ A: Circle

○ B: Parabola

○ C: Hyperbola

○ D: Ellipse

11. What is angle CAB in the given figure?



○ A: 35°

○ B: 45°

○ C: 55°

○ D: 65°

12. A line y = mx + c intersects a circle $x^2 + y^2 = a^2$. The point of intersection are imaginary if?

○ A: $a^2 (1+m^2) - c^2 > 0$

○ B: $a^2 (1+m^2) - c^2 = 0$

○ C: $a^2 (1+m^2) - c^2 < 0$

○ D: Intersection points are never imaginary.

13. If a circle is represented by the equation $x^2 + y^2 + 4x - 6y - 12 = 0$. Then the point (-5,6) is?

○ A: Inside the circle

○ B: Outside the circle.

○ C: On the circle.

○ D: Center of the circle.

14. Circle is a special case of ellipse with eccentricity = ?

○ A: -1

○ B: 0

○ C: 1

○ D: 2

15. The parametric form of equation (a cos Θ, b sin Θ) is for?

○ A: Circle

○ B: Hyperbola

○ C: Ellipse

○ D: Parabola

16. Equation of the directrices of hyperbola $y^2/a^2 - x^2/b^2 = 1$ is given by?

○ A: $x = \pm c/e^2$

○ B: $x = \pm b/e$

○ C: $y = \pm c/e^2$

○ D: $y = \pm b/e$

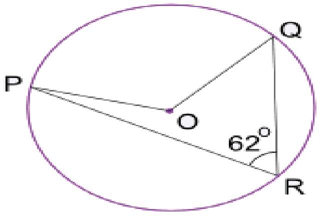
17. If e > 1 then the conic section is a?

○ A: Parabols
○ B: Ellipse
○ C: Hyperbola
○ D: Circle.

18. If a plane cutting one section of a double cone is slightly tilted and not parallel to the generator of the cone, we get a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

19. What is the angle POQ in the given diagram?



○ A: 62°
○ B: 102°
○ C: 124°
○ D: 132°

20. Focal chord perpendicular to the axis of the parabola is called?

○ A: Directrix.
○ B: Tangent Chord
○ C: Latusrectum.
○ D: Vertex.

TEST 2

1. **For a general form of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius is given by**?

○ A: $g + f + c$
○ B: $\sqrt{g^2 + f^2}$
○ C: $\sqrt{g^2 + f^2 - c}$
○ D: $\sqrt{g^2 + f^2 + c}$

What is the eccentricity of the ellipse given by equation $x^2/9 + y^2/4 = 1$?

○ A: 5/3
○ B: √5/3
○ C: 2/3
○ D: √2/3

2. **The equations $x = at^2$, $y = at$; $t \in R$ represents?**

○ A: A circle
○ B: A parabola
○ C: A hyperbola
○ D: An ellipse

3. **Intersecting properties of conic sections were discovered by?**

○ A: Pythagoras
○ B: Eudoxus and Georg Cantor
○ C: Euclid
○ D: Apollonius and Pappus

4. **What are the coordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$?**

○ A: (2,-1)
○ B: (2,1)
○ C: (-2,-1)
○ D: (2,0)

5. **What is the focus of the parabola $4x - y^2 = 2y + 13$?**

○ A: (3,-1)
○ B: (3,1)
○ C: (4, 1)
○ D: (4, -1)

6. What are the foci of hyperbola $x^2/9 - y^2/4 = 1$?

○ A: $(\pm\sqrt{5}\ , 0)$ ○ B: $(0\ , \pm\sqrt{5})$

○ C: $(0, \pm\sqrt{13})$ ○ D: $(\pm\sqrt{13}\ , 0)$

7. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x-a)$ is?

○ A: 90° ○ B: 60°

○ C: 45° ○ D: 30°

8. Equation of a line tangent to ellipse at $x^2/a^2 + y^2/b^2 = 1$ at points (4,10) is?

○ A: $4x/a^2 + 10y/b^2 = 1$ ○ B: $10x/a^2 + 4y/b^2 = 1$

○ C: $16x/a^2 + 100y/b^2 = 1$ ○ D: $100x/a^2 + 16y/b^2 = 1$

9. The line $y = 2x + c$ is tangent to the ellipse $x^2/16 + y^2/4 = 1$ if c equals?

○ A: $\sqrt{29}$ ○ B: $\sqrt{60}$

○ C: $\sqrt{68}$ ○ D: $\sqrt{74}$

10. What is the center of the ellipse $x^2 + 4y^2 + 4x - 24y + 24 = 0$?

○ A: (-2,3) ○ B: (-2, -3)

○ C: (2,3) ○ D: (2,-3)

11. Which of the following is not an equation of a circle?

○ A: $x^2 + y^2 - x + 98y + 11 = 4$ ○ B: $x^2 + y^2 + 18x + 98y + 11 = 0$

○ C: $5x^2 + 5y^2 + 14x + 12y - 10 = 0$ ○ D: $x^2 + 3y^2 + 10x - 9y + 11 = 0$

12. Latusrectum of the parabola $y^2 = -4ax$ is?

○ A: $x = a$ ○ B: $x = -a$

○ C: $y = a$ ○ D: $y = -a$

13. The equations $x = a \cos \theta$, $y = b \sin \theta$, $0 \leq \theta < 2\pi$, $a \neq b$, represents?

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

14. The vertex of the parabola $(y - a)^2 = 4a (x - a)$ is?

○ A: (0,a) ○ B: (a,0)

○ C: (0,0) ○ D: None of the above.

15. A second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola if?

○ A: $h^2 - ab = 0$ ○ B: $h^2 - ab > 0$

○ C: $h^2 - ab < 0$ ○ D: None of the above.

16. What is the length of the major axis for the ellipse $x^2/16 + y^2/4 = 1$?

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

17. The equation $y = mx + a/m$ is tangent to $y^2 = 4ax$ for m = ?

○ A: 0 ○ B: 1

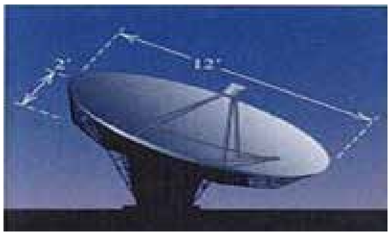
○ C: All positive values ○ D: All nonzero values

18. What is the center of a circle represented by a general form $5x^2 + 5y^2 + 24x + 36y + 10 = 0$?

○ A: (-12/5 , -18/5) ○ B: (12/5 , 18/5)

○ C: (-9/5 , -7/5) ○ D: (9/5 , 7/5)

19. The interior of a satellite dish has diameter 12 ft and 2 ft deep as shown in the figure below. What is the distance from the center of the dish to the focus?



○ A: 4.5 ft ○ B: 5.5 ft
○ C: 6.0 ft. ○ D: 6.2 ft

TEST 3

1. Minimum number of non-collinear points on a circle required to form an equation of a circle are?

○ A: 2 ○ B: 3
○ C: 4 ○ D: 5

2. The foci of an ellipse are (0, ± 1) and minor axis is of unit length. The equation of the ellipse is ?

○ A: $2x^2 + 4y^2 = 5$ ○ B: $4x^2 + 2y^2 = 5$
○ C: $15x^2 + 6y^2 = 1$ ○ D: $20x^2 + 4y^2 = 5$

3. The sum of distances of any point on the ellipse $3x^2 + 4y^2 = 24$ from its foci is?

○ A: 8 units ○ B: $2\sqrt{2}$ units
○ C: $4\sqrt{2}$ units ○ D: 7 units

4. The line $y + 2x - 5 = 0$ with respect to the circle $x^2 + y^2 + 2x - 9 = 0$?

○ A: Cuts the circle at two distinct points.
○ B: Tangent to the circle. ○ C: Do not touch the circle.
○ D: None of the above.

5. If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then a is equal to?

○ A: 15/16 ○ B: 9/7
○ C: 5/4 ○ D: 2/3

6. What is the equation of tangent to the circle $x^2 + y^2 + 5/3\,x - 13/3\,y + 2/3 = 0$ at (1, 10/3)?

○ A: $21x - 33y + 89 = 0$ ○ B: $33x + 21y + 157 = 0$
○ C: $8x + 46y - 22 = 0$ ○ D: $3x + 19y + 27 = 0$

7. What is the equation of a circle with diameter between two points A (2,3) and B (4,6)?

○ A: $x^2 + y^2 + 3x - 9y - 23 = 0$ ○ B: $x^2 + y^2 - 9x - 2y + 11 = 0$
○ C: $x^2 + y^2 - 6x - 9y + 26 = 0$ ○ D: Cannot be determined from the given information.

8. If e_1 and e_2 are eccentricities of the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$ and $x^2/b^2 - y^2/a^2 = 1$ then?

○ A: $e_1 = e_2$ ○ B: $e_1 * e_2 = 1$
○ C: $e_1 + e_2 = 0$ ○ D: $1/e_1^2 + 1/e_2^2 = 1$

9. The line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$ if c equals?

○ A: 2 ○ B: 1/2
○ C: 0 ○ D: -1/2

10. The equation of the circle whose diameter is the latusrectum of the parabola $x^2 = 4y$ is?

○ A: $x^2 + (y-1)^2 = 4$ ○ B: $(x - 2)^2 + (y - 1)^2 = 4$

○ C: $y^2 + (x-1)^2 = 4$ ○ D: $y^2 + (x-1)^2 = 2$

11. Line $y = 2c$ is a tangent to the parabola $y^2 = 4ax$ if c is equal to?

○ A: 0 ○ B: 4

○ C: 2a ○ D: None of the above.

12. The line $5y + 12x - 39 = 0$ to the circle $x^2 + y^2 = 9$?

○ A: Cuts the circle in two distinct points.

○ B: Do not touch the circle ○ C: Is tangent to circle

○ D: Cuts the circle at two imaginary points

13. What is the equation of a circle passing through non collinear points A(5, 8) and B(-2,9)?

○ A: $x^2 + y^2 + 4x - 12y - 20 = 0$ ○ B: $x^2 + y^2 + 4x - 9y - 15 = 0$

○ C: $x^2 + y^2 + 9x - 7y + 3 = 0$ ○ D: Equation cannot be formed from the given information.

14. What is the focus of the ellipse given by the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$?

○ A: $(1, \pm\sqrt{5})$ ○ B: $(1,-1\pm\sqrt{5})$

○ C: $(1,1\pm\sqrt{5})$ ○ D: $(1\pm\sqrt{5}, -1)$

15. $x = \dfrac{e^t + e^{-t}}{2}$, $y = \dfrac{e^t - e^{-t}}{2}$; $t \in R$ represents

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

16. The line $y = mx + 1$ is tangent to parabola $y^2 = 4x$ if m = ?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

17. Slope of the normal at point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is?

○ A: 1/t ○ B: t

○ C: -t ○ D: -1/t

18. What is the equation of the asymptotes for the given hyperbola?

$4x^2 - 9y^2 - 32x - 18y + 19 = 0$.

○ A: $(y + 1) = \pm 2/3 (x - 4)$ ○ B: $(y + 1) = \pm 4/9 (x - 4)$

○ C: $(y - 1) = \pm 2/3 (x + 4)$ ○ D: $(y - 1) = \pm 4/9 (x + 4)$

19. The general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a hyperbola if?

○ A: $h^2 - ab < 0$ ○ B: $h^2 - ab = 0$

○ C: $h^2 - ab > 0$ ○ D: None of the above.

20. The point on the curve $y^2 = x$, where the tangent line makes an angle of 45° with the x-axis is?

○ A: (3/4,1/2) ○ B: (1/4,1/2)

○ C: (1/4,3/2) ○ D: (1,2)

TEST 4

1. **Parametric form of equation for a cricle is?**

○ A: $(a \sec \Theta, b \tan \Theta)$
○ B: $(r \cos \Theta, r \sin \Theta)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(at^2, 2at)$

2. **What is the vertex of the parabola $y = -2x^2 + 4x + 1$?**

○ A: (2,1)
○ B: (-2,-1)
○ C: (-1,-3)
○ D: (1,3)

3. **If one foci of the ellipse is at (-3,0) and the ellipse is centered around the origin. What is the distance between the two foci of the ellipse?**

○ A: Cannot be determined.
○ B: 9
○ C: 6
○ D: 3

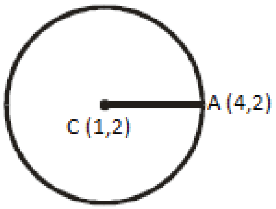
4. **What is the focus of the parabola $y^2 - x - 2y + 2 = 0$?**

○ A: (3/4 , 1)
○ B: (1/4 , 0)
○ C: (1/4 , 1)
○ D: (5/4 , 1)

5. **Axis of the parabola $9y^2 - 16x - 12y - 57 = 0$ is?**

○ A: 2/3
○ B: 3/2
○ C: -2/3
○ D: -3/2

6. **What is the equation of the circle given in the figure below?**



○ A: $(x - 1)^2 + (y - 2)^2 = 16$
○ B: $(x + 1)^2 + (y + 2)^2 = 9$
○ C: $(x - 1)^2 + (y - 2)^2 = 9$
○ D: $(x - 1)^2 + (y + 2)^2 = 16$

7. **Parametric form of equation for a parabola is?**

○ A: $(r \cos \Theta, r \sin \Theta)$
○ B: $(at^2, 2at)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(a \sec \Theta, b \tan \Theta)$

8. **The equation of the parabola with focus at (0, a) and directrix $y + a = 0$ is ($a > 0$) ?**

○ A: $x^2 = 4ay$
○ B: $x^2 = -4ay$
○ C: $y^2 = 4ax$
○ D: $y^2 = -4ax$

9. **The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is?**

○ A: (4,4)
○ B: (2,2)
○ C: $(\sqrt{2}, 2)$
○ D: $(2\sqrt{2}, 2)$

10. **For a general equation $Ax^2 + By^2 + Gx + Fy + C = 0$, if A is not equal to B and both have opposite signs then it represents?**

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

11. The line $y = mx + c$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ if?

○ A: $c = a/m$

○ B: $c^2 = a^2 m^2 + b^2$

○ C: $c^2 = a^2 m^2 - b^2$

○ D: None of the above.

12. If a is the major axis, b is the minor axis and e is the eccentricity of an ellipse. Its directrices are given by?

○ A: $\pm c/e$

○ B: $\pm b/e$

○ C: $\pm a/e$

○ D: $\pm b/e^2$

13. The equation $(y - y_1)(x_1 + g) = (x - x_1)(y_1 + f)$ represents?

○ A: Tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)

○ B: Normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)

○ C: Chord of a circle $x^2 + y^2 + 2gx + 2fy + c = 0$ through point (x_1 , y_1)

○ D: None of the above.

14. If the length of major axis of ellipse is 2a and length of minor axis is 2b. Then the length if latusrectum is approximately?

○ A: $4b/a$

○ B: $4a^2/b$

○ C: $2b^2/a$

○ D: $a/2b$

15. When the cutting of a conic section is perpendicular to the axis of the cone, it represents a/an?

○ A: Circle

○ B: Parabola

○ C: Hyperbola

○ D: Ellipse

16. What is the length of the tangent from point (-5, 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$?

○ A: $\sqrt{29}$

○ B: $\sqrt{67}$

○ C: $\sqrt{102}$

○ D: $\sqrt{133}$

17. From a point P outside a circle, how many tangents can be drawn?

○ A: 1

○ B: 2

○ C: 3

○ D: 4

18. What is the radius of a circle represented by the equation $x^2 + y^2+12x - 10y = 0$?

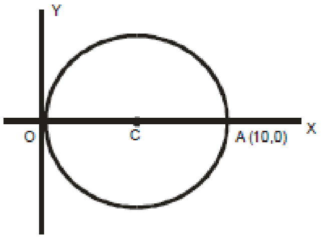
○ A: $\sqrt{61}$

○ B: $\sqrt{55}$

○ C: $\sqrt{52}$

○ D: $\sqrt{47}$

19. Equation of the circle given in the figure below is?



○ A: $x^2 + y^2 = 25$

○ B: $(x-5)^2 + y^2 = 25$

○ C: $(x + 5)^2 + y^2 = 25$

○ D: $(x + 5)^2 + y^2 = 10$

20. Find the equation of an ellipse with centre (0,0), focus (0,-3) and one vertes at (0,4)?

○ A: $x^2/16 + y^2/7 = 1$

○ B: $x^2/7 + y^2/16 = 1$

○ C: $x^2/\sqrt{7} + y^2/4 = 1$

○ D: $x^2/7 + y^2/4 = 1$

Vectors

TEST 1

1. **What are the direction cosines of unit vector**

$$\hat{\underline{v}} = \left[\frac{6}{\sqrt{41}}, \frac{-2}{\sqrt{41}}, \frac{1}{\sqrt{41}}\right]$$

○ A: 0, 0, 0
○ B: -6/√41 , +2/√41, -1/√41
○ C: 6/√41 , -2/√41, 1/√41
○ D: None of the above.

2. **If volume of a parallelepiped with a ,b , c as co-terminus edges is 36 the volume of the tetrahedron with the same edges is?**

○ A: 13
○ B: 12
○ C: 6
○ D: 3

3. **Value of [i, i , k] is?**

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

4. **The value of 2*i* x 4*k* =?**

○ A: 0
○ B: 8k
○ C: -8j
○ D: 8j

5. **The volume of the parallelepiped with *u* , *v* and *w* as its coterminus edges is?**

○ A: u.(v x w)
○ B: 1/2 * u.(v x w)
○ C: 1/6 * u.(v x w)
○ D: u x (v x w)

6. **If ā is a unit vector. Then the value of ā.ƃ is? Assume that the two vectos are not perpendicular to each other.**

○ A: 0
○ B: 1
○ C: ā cos θ
○ D: ƃ cos θ

7. **Which of the following statement is true?**

○ A: Only dot product possesses distributive property
○ B: Only cross product possesses distributive property
○ C: Both dot and cross product possess distributive property
○ D: Neither dot nor cross product possess distributive property

8. **The value of (2*j x i*) - 3*k* = ?**

○ A: -5k
○ B: 5k
○ C: k
○ D: -k

9. **Find the magnitude of vector v = -3i + 4j ?**

○ A: 2
○ B: 3
○ C: 4
○ D: 5

10. **If terminal point of a vector coincides with its origin point then it is called?**

○ A: Unit Vector.
○ B: Null Vector.
○ C: Equity Vector.
○ D: Negative Vector.

11. If ā = [1,-3] and ƃ = [2,5] ; 4ā + 2ƃ = ?

○ A: [3,2]
○ B: [8,2]
○ C: [-8,2]
○ D: [8,-2]

12. If ā, ƃ and c are three vectors representing three edges of a parallelepiped. Its volume is given by?

○ A: ā x ƃ x c
○ B: ā . ƃ . c
○ C: ā . (ƃ x c) / 2
○ D: ā . (ƃ x c)

13. If three vectors are coplanar then their scalar triple product is?

○ A: 0
○ B: 1
○ C: -1
○ D: Equal to vector triple product.

14. i.j = ?

○ A: 0
○ B: 1
○ C: -1
○ D: k

15. If ā = i - k and ƃ = j + k then the projection of ā along ƃ is?

○ A: -1/√2
○ B: 1/√2
○ C: 1
○ D: -1

16. If k is a scalar ā x kƃ = ?

○ A: kā x ƃ
○ B: k (ā x ƃ)
○ C: kā x kƃ
○ D: Both A and B.

17. If ā = [2,1,3] and ƃ = [-1,4,0]. What is the magnitude of ā - 2ƃ?

○ A: 16
○ B: √74
○ C: √93
○ D: 36

18. What is the unit vector for v = 3i - j +2k?

○ A: [3/√14 , 1/√14, 2/√14]
○ B: [5/√37 , -2/√37, 7/√37]
○ C: [1/√37 , 8/√37, -3/√37]
○ D: [3/√14 , -1/√14, 2/√14]

19. The position vector of a point P(x, y, z) is denoted by?

○ A: $\overrightarrow{PQ}$
○ B: $\overrightarrow{P}$
○ C: $\overrightarrow{OP}$
○ D: All of the above.

20. k.k =?

○ A: 0
○ B: 1
○ C: -1
○ D: j

TEST 2

1. **If AB = i + j + k, AC = -4k and AD = i +2j - 8k then the volume of tetrahedron ABCD formed by the three vectors is?**

   ○ A: 1 ○ B: 2/3

   ○ C: 2 ○ D: 4

2. **What is the value of α such that αi + j , i + j + 3k and 2i + j - 2k are coplanar?**

   ○ A: 1/3 ○ B: 7/4

   ○ C: 9/5 ○ D: 8/5

3. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors such that $|\vec{b}| = |\vec{c}|$, then $\left[(\vec{a}+\vec{b}) \times (\vec{a}+\vec{c})\right] \times (\vec{b} \times \vec{c}) =$

   ○ A: 1 ○ B: -1

   ○ C: 0 ○ D: 2

4. **(2j x 3i).k = ?**

   ○ A: 0 ○ B: 7

   ○ C: 6 ○ D: -6

5. **What is the vector perpendicular to both vectors ā = 2i - j + k and b̄ = 4i + 2j - k?**

   ○ A: -i + 6j + 8k ○ B: -2i + 3j + 9k

   ○ C: 3i + 1j + 7k ○ D: 5i - 3j + k

6. **If ā = 2i - 4j + 5k and b̄ = 4i + xj - 4k. What is the value of x if ā and b̄ are perpendicular to each other?**

   ○ A: -1 ○ B: -2

   ○ C: -3 ○ D: -4

7. **Which of these vectors are parallel?**

   a = 2i + 3j + k, b = 4i + 6j + 2k, c = 6i + 9j + 3k

   ○ A: a and b ○ B: a and c

   ○ C: a, b and c all are parallel to each other.

   ○ D: None of them is parallel.

8. **Unit vector perpendicular to i - j and i + j is?**

   ○ A: k ○ B: -k

   ○ C: (i - j) / 2 ○ D: (i + j) / √2

9. **Which of the following expressions is meaningful?**

   ○ A: u.(v x w) ○ B: (u.v) .w

   ○ C: (u.v) . w ○ D: None of the above.

10. **Zero vector is?**

    ○ A: Parallel to every vector. ○ B: Perpendicular to every vector.

    ○ C: Both parallel and perpendicular to every vector.

    ○ D: Is inverse of every vector.

TEST 3

1. The point which divides the line joining (2, 4, 5) and (-3, 5, - 4) in the ratio 2 : 3, lies on?

○ A: XY plane ○ B: YZ plane

○ C: XZ plane ○ D: None of the above.

2. If result of two forces ā of magnitude (P) and ƃ of magnitude (Q) isperpendicular to ā and has magnitude P. Then the magnitude of ƃ is?

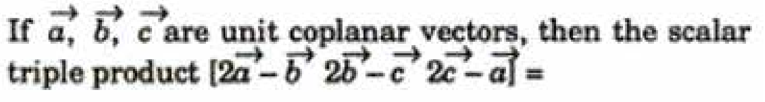
○ A: P ○ B: P√2

○ C: P√3 ○ D: 2P√3

3. If ā x ƃ = ā x ē then which of the following is true?

○ A: ā, ƃ and ē are coplanar. ○ B: ā, ƃ and ē are orthogonal

○ C: ƃ = ē ○ D: ā is parallel to ƃ

4. 

If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}\ \ 2\vec{b}-\vec{c}\ \ 2\vec{c}-\vec{a}] =$

○ A: 0 ○ B: 1

○ C: √2 ○ D: √3

5. If ā, ƃ, ē, ō are the vertices of a square then?

○ A: ƃ - ā = ē – ƃ ○ B: ā + ƃ + ē = 0

○ C: (ē - ā) . (ō - ƃ) = 0 ○ D: None of the above.

6. If the vectors a, b and c be the vectors representing the sides AB, BC and CA respectively of a triangle ABC, then?

○ A: a.(bxc) = 0 ○ B: (a.b) x c = (a.c) x b

○ C: |a x b| = |a x c| = |b x c| ○ D: |a x b| + |b x c| + |c x a| = 0

Position vector a = 2i - 3j and b = 3i + 2j. What are the coordinates of position vector that divides the line between a and b in ration 4:3?

○ A: 11/7 i + 8/7 j ○ B: 1/7 i - 5/7 j

○ C: 18/7 i - 1/7 j ○ D: 23/7 i + 3/7 j

7. The points (5, 2, 4), (6, −1, 2) and (8, −7, k) are collinear if k is equal to?

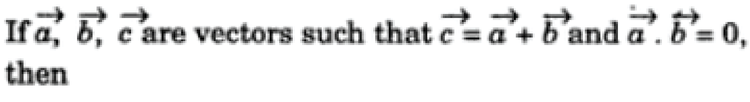
○ A: 3 ○ B: 2

○ C: -1 ○ D: -2

8. If A (-2,-3), B (1,4), C(0,-5) are three vertices of parallelogram ABCD. What are the coordinates of D if AB is parallel to DC?

○ A: (3,14) ○ B: (-4,11)

○ C: (-3, -12) ○ D: (-4, 9)

9. 

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{c}=\vec{a}+\vec{b}$ and $\vec{a}\cdot\vec{b}=0$, then

○ A: $a^2 + b^2 + c^2 = 0$ ○ B: $a^2 - b^2 = c^2$

○ C: $a^2 + b^2 = 0$ ○ D: $c^2 = a^2 + b^2$

10. **The point having position vectors $2\hat{i}+3\hat{j}+4\hat{k}$, $3\hat{i}+4\hat{j}+2\hat{k}$, $4\hat{i}+2\hat{j}+3\hat{k}$ are the vertices of a triangle. The triangle is?**

○ A: Right angled. ○ B: Equilateral.
○ C: Isosceles. ○ D: None of the above.

11. **The points with position vectors $14\hat{i}-13\hat{j}$, $12\hat{i}-5\hat{j}$ and $a\hat{i}+11\hat{j}$ are collinear if a equals**

○ A: 8 ○ B: 13
○ C: -5 ○ D: -9

12. **Angles α , β and δ are direction angles of a single vector only if?**

○ A: $\cos^2\alpha = \cos^2\beta = \cos^2\delta$ ○ B: $\cos^2\alpha = \cos^2\beta + \cos^2\delta$
○ C: $\cos^2\alpha + \cos^2\beta + \cos^2\delta = 0$ ○ D: $\cos^2\alpha + \cos^2\beta + \cos^2\delta = 1$

13. **Let $\vec{a}=\hat{i}-\hat{k}$, $\vec{b}=x\hat{i}+\hat{j}+(1-x)\hat{k}$ and $\vec{c}=y\hat{i}+x\hat{j}+(1+x-y)\hat{k}$, then $[\vec{a}\ \vec{b}\ \vec{c}]$ depends on**

○ A: Only x ○ B: Only y
○ C: Both x and y ○ D: Neither x nor y

TEST 4

1. **Unit vector in the direction of vector v = [-3,-4] is?**

○ A: -3/5 i - 4/5 j ○ B: -3/5 i + 4/5 j
○ C: 3/5 i - 4/5 j ○ D: 3/5 i + 4/5 j

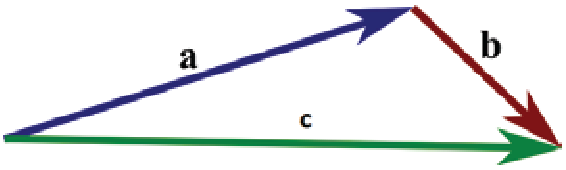
2. **Let a = 2i + j + k, a vector c perpendicular to a is?**

○ A: $\frac{1}{\sqrt{2}}(-j+k)$ ○ B: $\frac{1}{\sqrt{3}}(i+j-k)$
○ C: $\frac{1}{\sqrt{5}}(-i-j-k)$ ○ D: $\frac{1}{\sqrt{2}}(i-2j)$

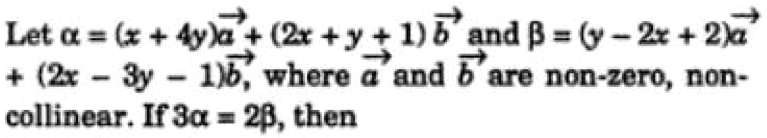
3. **The area (in square units) of the parallelogram whose diagonals are $\vec{a}=\hat{i}+\hat{j}-2\hat{k}$ and $\vec{b}=\hat{i}-3\hat{j}+4\hat{k}$**

○ A: √7 ○ B: √11
○ C: √14 ○ D: Cannot be determined from the given information.

4. **In the figure below vector b is given by?**



○ A: c + a ○ B: c - a
○ C: a – c ○ D: None of the above.

5. 

Let $\alpha = (x + 4y)\vec{a} + (2x + y + 1)\vec{b}$ and $\beta = (y - 2x + 2)\vec{a} + (2x - 3y - 1)\vec{b}$, where $\vec{a}$ and $\vec{b}$ are non-zero, non-collinear. If $3\alpha = 2\beta$, then

○ A: x= 1, y = -2 ○ B: x= -2, y = -1

○ C: x= 2, y = 2 ○ D: x= 2, y = -1

6. **For two position vectors ā and ƃ. The coordinates of position vector dividing the line between ā and ƃ in ration 1 : 1 would be?**

○ A: (ā - ƃ) / 2 ○ B: (ā + ƃ) / 2

○ C: (ā + ƃ) / 4 ○ D: (ā - ƃ) / 4

7. **If magnitude of vector ā = 25 the ā.ā = ?**

○ A: 5 ○ B: 25

○ C: 625 ○ D: 0

8. **Which of the following is not a defined quantity?**

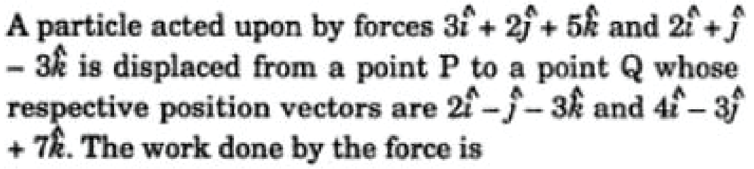
○ A: i.i / k.k ○ B: i.j / j.j

○ C: i.i / i.k ○ D: All of them are defined quantities.

9. **If ā.i = 0 and ā.j = 0 and ā.k = 0 then value of ā is?**

○ A: i + j + k ○ B: [-1,-1,-1]

○ C: Unit vector. ○ D: Null vector.

10. 

A particle acted upon by forces $3\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}$ is displaced from a point P to a point Q whose respective position vectors are $2\hat{i} - \hat{j} - 3\hat{k}$ and $4\hat{i} - 3\hat{j} + 7\hat{k}$. The work done by the force is

○ A: 16 ○ B: 24

○ C: 36 ○ D: 38

11. **Value of [k, i, j] is?**

○ A: 0 ○ B: 1

○ C: -1 ○ D: √-1

12. **Area of a parallelogram which has vectors i and i + j as the adjecent sides is?**

○ A: ½ ○ B: 1

○ C: 2 ○ D: √2

13. **If ā x ƃ = i + 2j + 2k then ƃ x ā= ?**

○ A: 1/3i + 2/3j + 2/3k ○ B: -i - 2j - 2k

○ C: 2i + 2j + k ○ D: None of the above.

14. **If ā = ƃ then the value of triple scalar product ā.(ƃ x c) is?**

○ A: 0 ○ B: 1

○ C: -1 ○ D: ā.ƃ

15. Which of the following quantities is undefined?

○ A: (i.i) / (i x j)
○ B: (i.j) / (j.j)
○ C: (j x k) / (i x j)
○ D: (i x k) / (j x j)

16. Which of the following statement is true?

If a.b = 0 a and b are parallel, If a x b = 0 then either a or b must be zero,

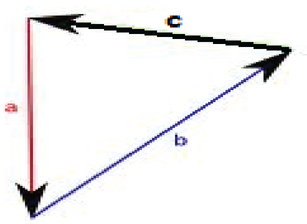
If a. (b x c) = 0 then a, b and c are coplanar.

○ A: iii only
○ B: i and ii only
○ C: ii and iii only
○ D: i, ii and iii

17. If $u = 2\hat{i} - 4\hat{j} + 5\hat{k}$ and $v = 4\hat{i} - 3\hat{j} - 4\hat{k}$ then *u* and *v* are?

○ A: Parallel
○ B: Perpendicular
○ C: Equal
○ D: Opposite

18. Which of the following is true about the vector diagram given below?



○ A: c = a + b
○ B: c = a - b
○ C: a + b = 0
○ D: a + b + c = 0

19. Which of the following position vectors have same magnitude?

a= [3,-4,2], b = [-3, 4, -2], c = [2, 4, 3]

○ A: a and b
○ B: a and c
○ C: All have same magnitude.
○ D: None of the has same magnitude.

20. In a parallelogram, the cross product of two adjacent vectors AB = i + 2j - 2j and BC = -2i + 2j + k is : 6i + 3j + 6k. The area of the parallelogram is?

○ A: 4.5
○ B: 9
○ C: 15
○ D: 18

I N D E X

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Number Systems

TEST 1

1. **i^{13} = ?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

2. **If -1 + √-3 = r $e^{i\Theta}$ then Θ equals to?**

○ A: 2 pi / 3
○ B: -2 pi / 3
○ C: pi / 3
○ D: - pi / 3

3. **Square roots of -1 are?**

○ A: i , -I
○ B: i
○ C: 1
○ D: -i

4. $\left(\frac{2i}{1+i}\right)^2$ **is equal to?**

○ A: I
○ B: 2i
○ C: 1-I
○ D: 1-2i

5. **Conjugate of 4 + 5i is?**

○ A: -4 + 5i
○ B: 4 - 5i
○ C: $4^2 + (5i)^2$
○ D: 5 + 4i

6. **$(1 + i)^2$ = ?**

○ A: 2i
○ B: -2i
○ C: I
○ D: -i

7. **The value of** $\frac{i^{4n+1} - i^{4n-1}}{2}$ **is equal to?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

8. **If y and g are two complex numbers then** $\overline{y+g} = ?$

○ A: $\bar{Y} . \bar{g}$
○ B: $\bar{Y} / \bar{g}$
○ C: $\bar{Y} + \bar{g}$
○ D: $\bar{Y} - \bar{g}$

9. **(3 + 2i) + (1 + i) = ?**

○ A: 4 + 2i
○ B: 4 + 3i
○ C: 4 - 2i
○ D: 4 - 3i

10. **The complex number i + √3 in polar form can be written as?**

○ A: $\frac{1}{\sqrt{2}}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ B: $2\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$
○ C: $\frac{1}{2}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ D: $4\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$

11. **If $g = 2 + i\sqrt{3}$ then $g.\bar{g}$ = ?**

○ A: $2 - i\sqrt{3}$
○ B: 13
○ C: 8
○ D: 7

12. **The moduli of complex number $1 - i\sqrt{3}$ = ?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

13. **4 * (1 - 3i) = ?**

○ A: 4 - 3i
○ B: 40
○ C: 4 - 12i
○ D: None of the above.

14. **Multiplicative identity for complex numbers is?**

○ A: (0 , 0)
○ B: (0 , 1)
○ C: (1 ,1)
○ D: (1 , 0)

15. **If z is a complex number then | z1 . z2 | = ?**

○ A: $\sqrt{(z1)^2 + (z2)^2}$
○ B: $\sqrt{(z1)^2 - (z2)^2}$
○ C: | z1 | x | z2 |
○ D: | z1 | / | z2 |

16. **(5, 0) * (2 , 0) = ?**

○ A: 10
○ B: 10 + i
○ C: 10 + 2i
○ D: 10 + 5i

17. **If z = 1 + i then multiplicative inverse of z^2 is?**

○ A: 1 – I
○ B: i / 2
○ C: - i / 2
○ D: 2i

18. **What is the product of (1 + i) and (1 + 2i)?**

○ A: -2 + I
○ B: 2 + i
○ C: -1 + 3i
○ D: 1 + 3i

19. **The value of | -5i | is?**

○ A: 5
○ B: 10
○ C: 20
○ D: 25

20. $\left(\frac{1-i}{1+i}\right)^{20}$ **is equal to?**

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: -1

TEST 2

1. **The complex number (1 + 2i) / (1 - i) lies in?**

○ A: I quadrant ○ B: II quadrant
○ C: III quadrant ○ D: IV quadrant.

2. **A complex number added to its additive inverse would give?**

○ A: Multiplicative identity ○ B: Additive identity
○ C: Additive inverse. ○ D: Multiplicative inverse.

3. **If y is a complex number then | -y | = ?**

○ A: | y | ○ B: $|\bar{y}|$
○ C: $|-\bar{y}|$ ○ D: All of the above.

4. **If z is a complex number such that z + 1/z = 1 then the value of $z^{99} + 1/z^{99}$ is ?**

○ A: 1 ○ B: -1
○ C: 2 ○ D: -2

5. Express in terms of *i* the sum of $\sqrt{-81}$ and $2\sqrt{-25}$.

○ A: 9i ○ B: -9i
○ C: 23i ○ D: 19i

6. **Even integers (including zero) are closed under which of the following operation?**

○ A: Addition ○ B: Subtraction
○ C: Multiplication ○ D: All of the above.

7. $\left[i^{67} + \frac{1}{i^{125}}\right] = ?$

○ A: 0 ○ B: 2
○ C: 2i ○ D: -2i

8. **If F = $x^3 + x^2 + 2x + 6$ then F(i) = ?**

○ A: 3 + I ○ B: 5 + i
○ C: 3 – I ○ D: 2 - 5i

9. **Find multiplicative inverse of √2 - i√5 ?**

○ A: -(√2 / 7) + (√5 / 7)I ○ B: (√2 / 7) - (√5 / 7)i
○ C: (√2 / 7) + (√5 / 7)I ○ D: -(√2 / 7) - (√5 / 7)i

10. **Square roots of number $(-3)^2$ are?**

○ A: 3i , -3i ○ B: 3
○ C: -3i ○ D: 3, -3

11. If y is a complex number then $y \cdot \bar{y}$ = ?

○ A: $\bar{y}$
○ B: y
○ C: $|-y|^2$
○ D: None of the above.

12. The modulus of the complex number $\dfrac{(1 - i\sqrt{3})(\cos\theta + i\sin\theta)}{2(1 - i)(\cos\theta - i\sin\theta)}$ is

○ A: 1/√2
○ B: 1/2√2
○ C: 1/√3
○ D: None of these.

13. $(\cos \Theta + i \sin \Theta)^n$ = ?

○ A: $(\cos \Theta^n + i \sin \Theta^n)$
○ B: cos nΘ - i sin nΘ
○ C: cos nΘ + i sin nΘ
○ D: ncos Θ + i n sin Θ

14. $i^5 + i^6$ = ?

○ A: 1 + I
○ B: -1 + i
○ C: i
○ D: 2I

15. $(-1)^{-21/2}$ = ?

○ A: 0
○ B: 1
○ C: I
○ D: -i

16. Multiplicative inverse of the complex number 1 + i is?

○ A: 1 – I
○ B: 1/2 + 1/2i
○ C: 1/2 - 1/2i
○ D: 1/√2 - i 1/√2

17. $\dfrac{2+i}{2-i} - \dfrac{2-i}{2+i} =$?

○ A: i / 5
○ B: i / 3
○ C: 8i / 5
○ D: 7i / 5

18. The conjugate complex of number $(2 - i) / (1 - 2i)^2$ is equal to?

○ A: 2 / 25 + i 11 / 25
○ B: 2 / 25 - i 11 / 25
○ C: - 2 / 25 + i 11 / 25
○ D: - 2 / 25 - i 11 / 25

19. If $8iz^3 + 12z^2 - 18z + 27i = 0$, then?

○ A: |z| = 3/2
○ B: |z| = 2/3
○ C: |z| = 1
○ D: |z| = 1/3

20. (8 , 9) * (5, -6) =?

○ A: (14, -1)
○ B: (94, -3)
○ C: (48, -2)
○ D: None of the above.

TEST 3

1. **The triangle formed by points 1 , (1 + i) / √2 and i in the argand diagram is?**

○ A: Scalene
○ B: Equilateral
○ C: Isoceles
○ D: Right angled

2. **The smallest integer n for which** $\left(\frac{1+i}{1-i}\right)^n = 1$ **is?**

○ A: 4
○ B: 8
○ C: 12
○ D: 16

3. **$i^{88} - i^{22}$ = ?**

○ A: I
○ B: -i
○ C: 1
○ D: 2

4. **If a = $|z_1| - |z_2|$; b = $|z_1 + z_2|$ and c = $|z_1| + |z_2|$ then which of the following is true?**

○ A: $c \leq b \leq a$
○ B: $a \leq c \leq b$
○ C: $b \leq a \leq c$
○ D: None of the above.

5. **if $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$, then b is equal to ?**

○ A: √3
○ B: √2
○ C: 1
○ D: None of the above.

6. **Number of solutions for the equation** $z^2 + \bar{z} = 0$ **is?**

○ A: One
○ B: Two
○ C: Three
○ D: Four

7. If *s* and *t* are different integers and $\sqrt{st} = 8$, which of the following could *not* be a value of *s* + *t*?

○ A: 16
○ B: 20
○ C: 34
○ D: 65

8. **The modulus of** $\sqrt{2i} - \sqrt{-2i}$ **is?**

○ A: 2
○ B: √2
○ C: 0
○ D: 2√2

9. If x = $\sqrt{-1-\sqrt{-1-\sqrt{-1-\sqrt{-1}}}}$ ... then x is equal to

○ A: w
○ B: w^2
○ C: w or w^2
○ D: 0

10. **The number of solutions for the equation $z^2 + |z|^2 = 0$ are? (z is a complex number)**

○ A: One
○ B: Two
○ C: Three
○ D: Infinite

11. The smallest positive number n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is?

○ A: 12
○ B: 8
○ C: 4
○ D: 2

12. For positive integers $(1-i)^n\left(1-\frac{1}{i}\right)^n$ equals to?

○ A: 0
○ B: $2i^n$
○ C: 2^n
○ D: 4^n

13. The complex numbers sin x + i cos 2x and cos x - i sin 2x are conjugate to each other for ?

○ A: x = n * pi
○ B: x = (n + 1/2) * pi
○ C: x = 0
○ D: No value of x.

14. Which of the following numbers lie on the imaginary axis of the Argand diagram?

○ A: 8 + 3i
○ B: 0 + 3i
○ C: 8 + 0i
○ D: None of the above.

15. Cube roots of unity?

○ A: Are collinear
○ B: Lie on the circle of radius √3
○ C: Form an equilateral triangle.
○ D: None of the above.

16. Which of the following is true about complex numbers?

○ A: They do not have a multiplicative inverse.
○ B: They don't have an additive inverse.
○ C: They always lie on the imaginary axis of the Argand diagram.
○ D: They don't satisfy the order of axioms.

17. Sum of three consecutive odd numbers is always divisible by?

○ A: 2
○ B: 3
○ C: 4
○ D: 6

18. $(a - ib)^3$ = ?

○ A: $a^3 - i(3a^2b - b^3)$
○ B: $a^3 - 3ab^2 - i(3a^3 - b^3)$
○ C: $a^3 + 3ab^2 - i(3a^2b - b^3)$
○ D: $a^3 - 3ab^2 - i(3a^2b - b^3)$

19. If $p^2 - 2pq + q^2 = c$ where p and q are positive integers and p is even and q is odd which of the following is true?

○ A: c is even and a perfect square.
○ B: c is odd and a perfect square.
○ C: c is even and not a perfect square.
○ D: c is odd and not a perfect square.

20. If $\left[\frac{(\sqrt{3}/2)+i\,(1/2)}{(\sqrt{3}/2)-i\,(1/2)}\right]^{120} = a + i\,b$, then

○ A: a = cos 20° and b = - sin 20°
○ B: a = cos 20° and b = sin 20°
○ C: a = 0 and b = 1
○ D: a = 1 and b = 0

TEST 4

1. $\left|(1+i)\left(\frac{2+i}{3+i}\right)\right|$ **is equal to?**

○ A: -1/2
○ B: 1/2
○ C: 1
○ D: -1

2. The value of $(-i)^{1/3}$ is ?

○ A: -I
○ B: i
○ C: 1
○ D: None of the above.

3. Which of the following is an irrational number?

○ A: $\sqrt[3]{-8}$
○ B: $\sqrt{\frac{32}{50}}$
○ C: 5 / √5
○ D: All of the above.

4. If $(x + iy)(p + iq) = (x^2 + y^2)i$ then?

○ A: p = x, q = y
○ B: $p = x^2$, $q = y^2$
○ C: q = x, p = y
○ D: None of the above.

5. If ⊙ is an operation on positive real numbers, for which of the following definitions of ⊙ is $r \odot s = s \odot r$ (commutative property)?

○ A: r Θ s = r – s
○ B: r Θ s = r / s
○ C: r Θ s = $r^2 s$
○ D: r Θ s = (r + s) / (rs)

6. The complex number 1 + i√3 in polar form is equal to?

○ A: 2 cos 60° - i 2 sin 60°
○ B: 4 cos 60° + i 4 sin 60°
○ C: 4 cos 60° - i 4 sin 60°
○ D: 2 cos 60° + i 2 sin 60°

7. (2 , 6) / (3 , 7) = ?

○ A: (6/29 , -1/29)
○ B: (2/29 , -2/29)
○ C: (24/29 , 2/29)
○ D: (18/29 , 2/29)

8. $\frac{(1+i)^n}{(1-i)^{n-2}}$ **is equal to?**

○ A: $4i^{n-2}$
○ B: $2i^{n-4}$
○ C: $2i^{n-1}$
○ D: None of the above.

9. **If $z = \frac{\sqrt{3}+i}{2}$, then $(z^{101} + i^{103})^{105}$ is equal to**

○ A: I
○ B: -1
○ C: 0
○ D: 1

10. Reciprocal of i is?

○ A: -1
○ B: 1
○ C: I
○ D: -i

11. $\frac{(1+i)^{2n+1}}{(1-i)^{2n-1}}$ is equal to?

○ A: $2\,(-1)^n$
○ B: 2i
○ C: -2
○ D: 2 + 2i

12. If $\bar{Y} = y$ then y is?

○ A: Complex number
○ B: Real number
○ C: $\bar{Y}$ is complex conjugate of y
○ D: None of the above.

13. The equation $|z-1|^2 + |z+1|^2 = 2$ represents?

○ A: A circle of radius 1
○ B: A circle of radius 2
○ C: Ordered pair (0, 0)
○ D: A straight line.

14. The number 4 + 3i lies on the ?

○ A: Imaginary axis of the Argand diagram.
○ B: Real axis of the Argand diagram.
○ C: Neither real nor imaginary axis of the Argand diagram.
○ D: None of the above.

15. Absolute value of complex number z = a + ib = ?

○ A: a + b
○ B: $a^2 + b^2$
○ C: $\sqrt{z.\tilde{z}}$
○ D: $z.\tilde{z}$

16. $\text{If } z = \left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^5$, then

○ A: Re (z) > 0
○ B: Re (z) > 0 and Im (z) > 0
○ C: Re (z) > 0 and Im (z) < 0
○ D: Im (z) = 0

17. $\sqrt{\frac{1}{-4}}$ is equal to?

○ A: i / 2
○ B: - i / 2
○ C: 2 I
○ D: -2 i

18. If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$ then α^{31} is equal to?

○ A: α
○ B: α^2
○ C: 0
○ D: 1

19. (a + bi) * (c + di) = ?

○ A: (ac - bd) + (ad + bc) I
○ B: (ac + bd) + (ad + bc) i
○ C: (ac - bd) + (ad - bc) I
○ D: (ac + bd) + (ad - bc) i

Sets & Functions

TEST 1

1. If $A \cap B = \Phi$ then A and B are called?

○ A: Complement of each other. ○ B: Null sets
○ C: Disjoint sets ○ D: Universal sets.

2. Residue class modulo 5 for 4 + 3 is?

○ A: 2 ○ B: 3
○ C: 5 ○ D: 7

3. $(A \cup B)' = ?$

○ A: $A' \cup B'$ ○ B: $A' \cap B'$
○ C: $A - B$ ○ D: $(A - B)'$

4. If $A = \{1,2,3\}$ and $B = \{2,3\}$, then $A \cup B = ?$

○ A: $\{1\}$ ○ B: $\{2,3\}$
○ C: $\{1,2\}$ ○ D: $\{1,2,3\}$

5. A set of all possible sub sets of a set is known as?

○ A: Power set ○ B: Proper subset
○ C: Singleton Set ○ D: Universal set.

6. $A \cap B = \Phi$ then $(A \cup B) = ?$

○ A: $(A \cup B) = A + B$ ○ B: $(A \cup B) = A + B - (A \cap B)$
○ C: $(A \cup B) = (A \cap B)$ ○ D: Undefined.

7. Set of all integers is not closed with respect to?

○ A: Addition ○ B: Subtraction
○ C: Multiplication ○ D: Division

8. Which of the following is a singleton set?

○ A: $\{\ \}$ ○ B: $\{0\}$
○ C: $\{5\}$ ○ D: Both B and C.

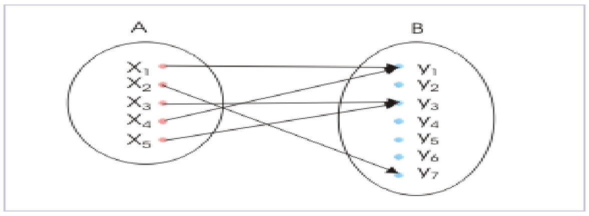
9. Drawing conclusion from limited number of observations is called?

○ A: Induction ○ B: Deduction
○ C: Logic ○ D: Proposition

10. $Z = \{x \mid x = p/q$ where $p,q \in Z$ and $q \neq 0\}$ is a set of?

○ A: Natural numbers ○ B: All integers
○ C: Irrational numbers ○ D: Rational numbers.

11. **The figure below shows what kind of function?**



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function

12. **Which of the following relations is true?**

○ A: 0 ∈ { }
○ B: 0 ∈ {Φ}
○ C: 0 ∈ {0}
○ D: None of the above.

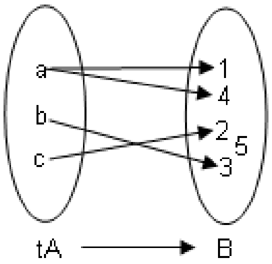
13. **Which of the following is defined with respect to the universal set?**

○ A: Difference of two sets.
○ B: Intersetction of sets
○ C: Union of sets
○ D: Complement of sets

14. **Aristotelian logic has how many possible outcomes?**

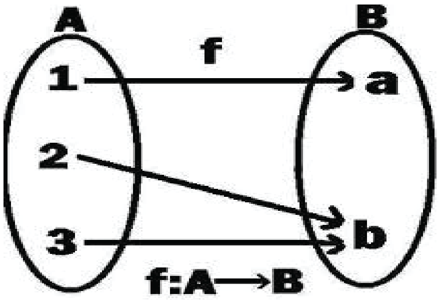
○ A: 1
○ B: 2
○ C: 3
○ D: 4

15. **The diagram below shows that?**



○ A: f is function from A to B
○ B: f is a one-one function from A to B
○ C: f is an onto function from A to B
○ D: f is not a function

16. **The figure below shows what kind of function?**



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

17. The domain of the function f = {(1, 3), (3, 5), (2, 6)} is?

○ A: 1, 3 and 2
○ B: {1,3,2}
○ C: 3, 5 and 6
○ D: {3,5,6}

18. Residue class modulo 7 for 9 + 5 is?

○ A: 14
○ B: 7
○ C: 3
○ D: 0

19. There are how many ways of describing a set?

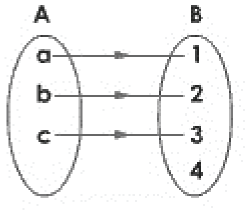
○ A: 1
○ B: 2
○ C: 3
○ D: 4

20. If A is a subset of B then A U B =?

○ A: A
○ B: B
○ C: A – B
○ D: B - A

TEST 2

1. The figure below shows what kind of function?



○ A: Into Function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

2. If $(x + 3, y - 2) = (7,5)$ then $(7x, 9y) = ?$

○ A: (3,-2)
○ B: (28,63)
○ C: (35,42)
○ D: (49,54)

3. If f = {(1, 4), (2, 5), (3, 6)} and g = {(4, 8), (5, 7), (6, 9)}, then (gof) is?

○ A: { }
○ B: {(1, 8), (2, 7), (3, 9)}
○ C: {(1, 7), (2, 8), (3, 9)}
○ D: None of the above.

4. Logical form of $(A \cup B)' = A' \cap B'$ is?

○ A: $\sim(p \vee q) = \sim p \wedge \sim q$
○ B: $\sim(p \wedge q) = \sim p \vee \sim q$
○ C: $(p \vee q) = p \wedge q$
○ D: $(p \vee q) \rightarrow \sim p \wedge \sim q$

5. If A and B are overlapping sets then A - B =?

○ A: A
○ B: B
○ C: $A - (A \cap B)$
○ D: $B - (A \cap B)$

6. To be classified as a group, the set must satisfy how many properties?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

7. Set of rational + irrational numbers is a set of?

○ A: All integers
○ B: All real numbers
○ C: Whole numbers
○ D: All of the above.

8. Let A = {1, 2, 3}. Then, the domain of the relation R = {(1, 1), (2, 3), (2, 1)} defined on A is?

○ A: {1,2}
○ B: {1,3}
○ C: {1,2,3}
○ D: None of the above.

9. All students who appear in GIKI entry test are pass, fail or put in the waiting list. If I appear in the GIKI entry test, I may pass, fail or be in the waiting list. This is an example of (choose the most appropriate answer)?

○ A: Induction
○ B: Deduction
○ C: Aristotelian logic
○ D: Non Aristotelian logic

10. A - B = Φ and A is not an empty then?

○ A: B = Φ
○ B: B - A = Φ
○ C: A is subset of B
○ D: B is subset of A.

11. If a set has 5 elements. Then number of elements in the power set would be?

○ A: 4
○ B: 8
○ C: 16
○ D: 32

12. Let A and B have 3 and 6 elements, respectively. What can be the minimum number of elements in A U B?

○ A: 3
○ B: 6
○ C: 9
○ D: Cannot determine.

13. If f : A → B be defined by f(x) = x + i, where i is a fixed integer and x set of integers, then f is?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function.
○ D: (1-1) and onto function.

14. If a set is closed with respect to an operation and the operation is associative then the set is called?

○ A: Semi group
○ B: Group
○ C: Monoid
○ D: Both A and C.

15. If A = {1, 2, 3} and B = {3, 4} and C = {4, 5, 6} then (A x B) ∩ (B x C) =?

○ A: {(1,4)}
○ B: {(3,4)}
○ C: {(1,4) , (3,4)}
○ D: {(2,4) , (1,3)}

16. The function f = {(1,2) , (1,3) , (1,4)} is a ?

○ A: Into function
○ B: Onto function
○ C: (1-1) onto function
○ D: None of the above.

17. Converse of $q \rightarrow p$ is?

○ A: $p \rightarrow q$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

18. Set of all integers such that |x-3| < 2 is?

○ A: {1,2,3,4}
○ B: {1,2,3,4,5}
○ C: {2,3,4}
○ D: None of the above.

19. If A={1,2,3} , B = {1,2,3} and C = {3,2,1} which of the following is true?

○ A: A = B
○ B: C is inverse of A
○ C: A = B = C
○ D: Both A and B.

20. If A is a subset of B then A - B = ?

○ A: A
○ B: B
○ C: A - (A U B)
○ D: Φ

TEST 3

1. **In a town, 48% people are educated, 51% people are young, 60% are servicemen, 24% are educated and young, 25% are young and servicemen, 27% are educated and servicemen and 5% have all three characteristics. How many people (in percentage terms)do not have any of these three characteristics?**

○ A: 12%
○ B: 9%
○ C: 5%
○ D: 0%

2. **The table below shows multiplication operation on a set S = {1,-1,i,-i}. Which of the following is most accurate about the set w.r.t multiplication?**

x	1	−1	*i*	−*i*
1	1	−1	*i*	−*i*
−1	−1	1	−*i*	*i*
i	*i*	−*i*	−1	1
−*i*	−*i*	*i*	1	−1

○ A: It is a monoid
○ B: It is a group
○ C: It is an abelian group
○ D: It is a semi group

3. **In a zoo, there are 42 animals in the first sector, 34 in the second sector and 20 in the third sector. Out of these, 24 graze in sector one and also in sector two, 10 graze in sector two and sector three and 12 graze in sector one and sector three. These figures also include four animals grazing in all the three sectors. Find the total number of animals?**

○ A: 46
○ B: 50
○ C: 54
○ D: 60

4. **Let R be a relation in N defined by R = {(1+x , x^2) : x < 5 and x Є N}. Which of the following is false?**

○ A: Domain of R = {2,3,4,5}
○ B: Range of R = {4,9,16,25}
○ C: R = {(1,2) , (2,4) , (3,9) , (4,16) , (5,25)}
○ D: R = {(2,4) , (3,9) , (4,16) , (5,25)}

5. **For b Є N, bN = {bx : x Є N} then the first value of the set 6N ∩ 8N is?**

○ A: 8
○ B: 16
○ C: 24
○ D: 48

6. **Which of the following is a Singleton set?**

○ A: { x : |x|=5 , x Є N}
○ B: { x : |x|=15 , x Є Z}
○ C: { x : x^2 , x Є Z}
○ D: { x : 1 + x , x Є N}

7. **The set {x : x ≠ x} is?**

○ A: {0}
○ B: {Φ}
○ C: {1}
○ D: { }

8. **If N_a = {an : n Є N}, find the value of $N_6 \cap N_8$?**

○ A: N_6
○ B: N_8
○ C: N_{12}
○ D: N_{24}

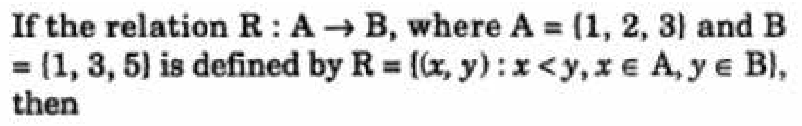
9. **If n(A) = 115 , n(B) = 326 and n(A ∩ B) = 65. Then n(A U B) = ?**

○ A: 68
○ B: 73
○ C: 128
○ D: 376

10. Which of the following cannot have a proper subset?

○ A: { x : x Є N}
○ B: { x : x Є Q, 3 < x < 4}
○ C: { x : x Є N, 3 < x < 4}
○ D: { x : x Є Z, 3 < x < 6}

11.



If the relation R : A → B, where A = {1, 2, 3} and B = {1, 3, 5} is defined by R = {(x, y) : x < y, x ∈ A, y ∈ B}, then

○ A: R = {(1,3) , (1,5) , (2,3) , (2,5) , (3,5)}
○ B: R = {(1,3) , (1,5) , (2,3) , (2,5) }
○ C: R^{-1} = {(3,1) , (5,1) , (3,2) , (5,2) , (3,3) }
○ D: R = {(1,1) , (1,3) , (1,5) , (2,3) , (2,5) }

12. Set of cube roots of unit w.r.t addition is?

○ A: Semi group
○ B: Group
○ C: Monoid
○ D: None of the above.

13. If X = {4^n – 3n – 1 : n Є N} and Y = {9 (n – 1) : n Є N}, find the value of X U Y?

○ A: X
○ B: Y
○ C: N
○ D: None of the above.

14. Let R by a relation in N defined by R = {(x,y) : x + 2y = 8}. The range of R is?

○ A: {2,4,6}
○ B: {1,2,3}
○ C: {2,4,6,8}
○ D: {1,2,3,4,5,6}

15. What are the missing entries in the conditional table below? (From top to bottom)

p	**q**	$p \rightarrow q$
T	T	?
T	F	?
F	T	?
F	F	?

○ A: T, F, F, T
○ B: T, T, T, F
○ C: T, F, T, F
○ D: T, F, T, T

16. The number of relations that can be defined on the set A = {a, b, c, d} is?

○ A: 16
○ B: 24
○ C: 4^4
○ D: 2^{16}

17. If n(A) = 115 , n(B) = 326 and n(A-B) = 47, then n(A ∩ B) = ?

○ A: 373
○ B: 158
○ C: 68
○ D: 44

18. Which of the following is an empty set?

○ A: { x : x Є R and $x^2 – 3 = 0$}
○ B: { x : x Є R and $x^2 + 3 = 0$}
○ C: { x : x Є R and x + 11 = 0}
○ D: { x : x Є R and $x^4 – 3 = 0$}

19. If for two sets A and B we have (A U B) = (A ∩ B) = B, then we have?

○ A: B = Φ and A ≠ Φ
○ B: A - B = Φ
○ C: B - A = Φ
○ D: A = B

20. The set of fourth roots of unity are closed with respect to?

○ A: Addition
○ B: Division
○ C: Subtraction
○ D: None of the above.

TEST 4

1. The inverse of function {(1,2) , (2,3) , (3,4)} is?

○ A: {(1,2) , (2,3) , (3,4)}
○ B: {(1,1/2) , (1/2,1/3) , (1/3,1/4)}
○ C: {(2,1) , (3,2) , (4,3)}
○ D: {(-1,-2) , (-2,-3) , (-3,-4)}

2. 46 in binary is?

○ A: 100110
○ B: 101111
○ C: 101110
○ D: 101010

3. In a town with a population of 5000, the number of people who are egg eaters is 3200. If 2500 are meat eaters and 1500 eat both egg and meat. How many of them eat neither meat nor egg?

○ A: 4200
○ B: 1500
○ C: 800
○ D: 500

4. If A = {1,2,3,4} then {(x,y) | $x+y < 5$} is a ?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function `
○ D: Not a function.

5. If A and B are disjoint sets then A - B = ?

○ A: A
○ B: B
○ C: B – A
○ D: Both A and C.

6. A group is called abelian group if?

○ A: It is closed
○ B: It satisfies associativity
○ C: It has inverse as part of the group.
○ D: It satisfied commutativity.

7. Let A = {a, b, c}. Then, the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is?

○ A: {a, b, c}
○ B: {a, b}
○ C: {a}
○ D: {b,c}

8. Contrapositive of $p \to q$ is?

○ A: $q \to p$
○ B: $\sim p \to \sim q$
○ C: $\sim q \to \sim p$
○ D: $\sim p \to q$

9. X = {0,1,2,3,4 .....} is a set of?

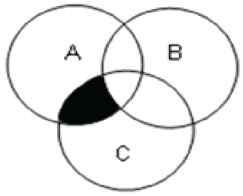
○ A: Natural numbers
○ B: Whole numbers
○ C: All integers
○ D: All of the above.

10. All Irish people drink beer. If someone is Irish he would definitely drink beer. The logic is an example of?

○ A: Proposition
○ B: Induction
○ C: Deduction
○ D: Logic analysis

The shaded area in this diagram represents

11.



○ A: $A \cap C$
○ B: $(A \cap B) - C$
○ C: $(A - C) \cap (A - B)$
○ D: $(A \cap C) - B$

12. Set of natural numbers is closed with respect to?

Addition, Multiplication, Subtraction

○ A: i only
○ B: ii only
○ C: i and ii only
○ D: i, ii and iii

13. If a function $f: A \rightarrow B$ is such that Ran $f = B$ then f is a/an ?

○ A: Into function
○ B: Onto function
○ C: (1 – 1) and onto
○ D: Both B and C.

14. A, B and C are three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Which of the following conditions is true according to the given statement?

○ A: $A = B$
○ B: $B = C$
○ C: $A = C$
○ D: $A = B = C$

15. The set of cube roots of unit is closed with respect to?

○ A: Multiplication
○ B: Addition
○ C: Subtraction
○ D: None of the above.

16. If set $A = \{1, w, w^2\}$ is an abelian group then inverse of w is?

○ A: 1
○ B: w
○ C: w^2
○ D: Abelian group does not have an inverse.

17. The range of the function $f(x) = |x - 1|$ is? Where domain is the set of all integers.

○ A: $(-\infty, \infty)$
○ B: $(0, \infty)$
○ C: $[0, \infty)$
○ D: $(-\infty, 0)$

18. Which of the following is true about the null set?

It is the subset of every set. Number of elements in its power set is zero. It contains no elements

○ A: iii only
○ B: i and iii only
○ C: ii and iii only
○ D: i, ii and iii.

19. $Z = \{x \mid x \neq p/q$ where $p, q \in Z$ and $q \neq 0\}$ is a set of?

○ A: Natural numbers
○ B: All integers
○ C: Irrational numbers
○ D: Rational numbers.

20. If $A \cap B \neq \Phi$ then $(A \cup B) = ?$

○ A: $A + B$
○ B: $(A \cup B) = A + B - (A \cap B)$
○ C: $(A \cup B) = A + B + (A \cap B)$
○ D: Φ

Matrices & Determinations

TEST 1

1. **Inverse of the matrix $\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ is?**

   ○ A: $10\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$ ○ B: $\frac{1}{10}\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$

   ○ C: $\frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$ ○ D: $10\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

2. **The matrix below has order of?**

   $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

   ○ A: 6 x 1 ○ B: 2 x 3

   ○ C: 3 x 2 ○ D: 2 x 2

3. **If *A* and *B* are matrices, then which from the following is true ?**

   ○ A: $A + B \neq B + A$ ○ B: $(A^t)^t \neq A$

   ○ C: $AB \neq BA$ ○ D: All are true.

4. **A squar matrix is one in which?**

   ○ A: $n = m^2$ ○ B: $n^2 = m$

   ○ C: $n = m$ ○ D: All numbers are squares of integers.

5. **The number of non-zero rows in an echlon form is called ?**

   ○ A: reduced echlon form ○ B: rank of the matrix

   ○ C: conjugate of the matrix ○ D: co-factor of the matrix

6. **M_{12} the matrix given below is?**

   $\begin{vmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{vmatrix}$

   ○ A: $\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix}$ ○ B: $\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix}$

   ○ C: $\begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix}$ ○ D: $\begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix}$

7. **The matrix given below is a?**

   $\begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 2 & 1 & 5 \end{bmatrix}$

   ○ A: Symmetric. ○ B: Skew Symmetric

   ○ C: Hermitian ○ D: Skew Hermitian

8. What is the order of the matrix given below?

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

○ A: 6 x 1 ○ B: 2 x 3

○ C: 3 x 2 ○ D: 2 x 2

9. Determinant of singular matrix is ?

○ A: 1 ○ B: positive

○ C: negative ○ D: 0

10. If the system of equations x – Ky – z = 0, Kx – y – z = 0, x + y – z = 0 has a non-zero solution, then the possible values of K are?

○ A: -1, 2 ○ B: 1, 2

○ C: 0, 1 ○ D: -1, 1

11. The following matrix is?

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{bmatrix}$$

○ A: Non singular ○ B: Unit matrix

○ C: Lower triangle. ○ D: Upper Triangle.

12. Value of $\begin{vmatrix} w & 1 & w \\ w & 2 & w \\ w & 3 & w \end{vmatrix}$ **is?**

○ A: w ○ B: 0

○ C: 1 ○ D: 2

13. If A = $\begin{bmatrix} 2 & 5 \\ 5 & 2 \end{bmatrix}$**, then** $A^3 - 4A^2$ **is equal to**

○ A: $\begin{bmatrix} 42 & 105 \\ -105 & 42 \end{bmatrix}$ ○ B: $\begin{bmatrix} 42 & 105 \\ 105 & 42 \end{bmatrix}$

○ C: $\begin{bmatrix} 105 & 42 \\ 105 & 42 \end{bmatrix}$ ○ D: None of the above.

14. A determinant remains same if :

○ A: Every element in a column is multiplied by the same factor

○ B: Two columns are interchanged. ○ C: Two rows are interchanged.

○ D: Each element of any row is added to the corresponding element of any other row multiplied by given factor

15. For matrices $(AB)^t$ **= ?**

○ A: A^tB^t ○ B: AB

○ C: B^tA^t ○ D: BA

16. If A = $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A|$ is?

○ A: 2

○ B: 3

○ C: 4

○ D: 5

17. If AB = A then, B is a?

○ A: Unity Matrixq

○ B: Identity Matrix

○ C: Inverse of A

○ D: Both A & B.

18. If the order of matrix *A* is *m* x *p*. And the order of *B* is *p* x *n*. Then the order of *AB* is ?

○ A: m x p

○ B: p x n

○ C: m x n

○ D: n x m

19. For matrices A^{-1} = ?

○ A: $Adj\ A\ |A|$

○ B: $|A|\ \frac{1}{Adj\,A}$

○ C: $\frac{1}{|A|\ A}Adj\ A$

○ D: $\frac{1}{|A|}Adj\ A$

TEST 2

1. Inverse for the matrix $a = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is?

○ A: $\frac{1}{ad-bc}\begin{bmatrix} d & b \\ c & a \end{bmatrix}$

○ B: $\frac{1}{ab-cd}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

○ C: $\frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

○ D: $\frac{1}{ad-bc}\begin{bmatrix} -d & -b \\ -c & -a \end{bmatrix}$

2. For matrices if AX = B then which of the following conditions holds?

○ A: $X = A^{-1}B$

○ B: $A^{-1}(AX) = BA^{-1}$

○ C: $X = BA^{-1}$

○ D: All of the above.

3. For matrices, if AX=B then X = ?

○ A: B / |A|

○ B: $\frac{1}{|A|} * adj(A.B)$

○ C: $B.(\frac{1}{|A|}adjA)$

○ D: $(\frac{1}{|A|} * adj\,A).B$

4. Fine the cofactor A_{23} for the matrix $\begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix}$

○ A: 7

○ B: 0

○ C: 23

○ D: -7

5. **The matrix** $B = \begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$ **can be defined as?**

○ A: Symmetric
`○ B: Skew Symmetric
○ C: Triangular
○ D: Hermitian

6. **Find the cofactor A_{22} for the** $\begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

○ A: 8
○ B: -7
○ C: -10
○ D: 3

7. **If A is a square matrix, then A^{-1} does not exist if**

○ A: |A|>0
○ B: |A|<0
○ C: |A|=0
○ D: A≠0

8. **Value of determinance is?**

○ A: 0
○ B: 1
○ C: x+y+z+w
○ D: xyzw

If

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

9. then order of matrix A = ?

○ A: 3 x 2
○ B: 2 x 3
○ C: 3 x 3
○ D: 2 x 2

10. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

○ A: 8
○ B: -8
○ C: 400
○ D: 0

11. **If I is an identity matrix, then?**

○ A: $I^n=0$
○ B: $I^n=I$
○ C: 2I=0
○ D: None of these.

12. **If x, y and z are non zero numbers. The inverse of matrix** $\begin{bmatrix} x & y \\ z & 1 \end{bmatrix}$ **is?**

○ A: $\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$
○ B: $\frac{1}{x-yz}\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$
○ C: $\begin{bmatrix} 1 & -y \\ -z & -x \end{bmatrix}$
○ D: None of these.

13. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then?

○ A: $\alpha = a^2 + b^2, \beta = -2ab$ ○ B: $\alpha = a^2 + b^2, \beta = ab$

○ C: $\alpha = a^2 - b^2, \beta = 2ab$ ○ D: $\alpha = a^2 + b^2, \beta = 2ab$

14. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 23 \\ 0 & -10 \end{bmatrix}$ then |AB| is?

○ A: 80 ○ B: 100

○ C: -110 ○ D: 90

15. The number of non-zero rows when a matrix is reduced to echelon matrix form is known as?

○ A: Rank of the matrix. ○ B: Degree of matrix.

○ C: Skew echelon of matrix. ○ D: None of the above.

16. If augmented matrix of a system is of form $\begin{bmatrix} 1 & 0 & : & 5 \\ 0 & 1 & : & -3 \end{bmatrix}$ Solution to the equations of the system is?

○ A: 1 and 0 ○ B: 0 and 1

○ C: 5 and -3 ○ D: None of the above.

17. The value of the determinant given below is equal to

$$\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$$

○ A: 6 xyz ○ B: xyz

○ C: 4 xyz ○ D: xy + yz +zx

18. If a matrix A is multiplid with a number k then the determinant of resulting matrix is?

○ A: k |A| ○ B: 1/k |A|

○ C: $k^2|A|$ ○ D: |A|

19. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

○ A: -3, 1 ○ B: -1, 3

○ C: 3, 1 ○ D: -3, -1

20. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ then A^2= ?

○ A: $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$ ○ B: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ ○ D: $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

TEST 3

1. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

○ A: [2, 4]　　○ B: [0, 4]

○ C: [1, 4]　　○ D: None of these.

2. **If A and B are symmetric matrices, then AB + BA is a?**

○ A: Symmetric matrix　　○ B: Skew symmetric matrix

○ C: Diagonal matrix　　○ D: Triangular matrix

3. **Which of the following is an Echelon form of a matrix?**

○ A: $\begin{bmatrix} 0 & 1 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$　　○ B: $\begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 0 & 2 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 8 \end{bmatrix}$　　○ D: Both A & B.

4. **1, 2, 3, 4 are four numbers. If a matrix of order m x n is formed by using all the four numbers, then how many set of values (m, n) are possible?**

○ A: 1　　○ B: 2

○ C: 3　　○ D: 4

5. If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

○ A: $\begin{bmatrix} 13 & 4 \\ 8 & 5 \end{bmatrix}$　　○ B: $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$　　○ D: $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

6. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x, y not equal to zero, then D is

○ A: Divisible by neither x nor y.　　○ B: Divisible by both x and y

○ C: Divisible by x but not y　　○ D: Divisible by y but not x

7. $\begin{vmatrix} a+x & b & c \\ a & b+y & c \\ a & b & c+z \end{vmatrix}$ is equal to

○ A: $xyz\,(1 + a/x + b/y + c/z)$　　○ B: $xyz\,(1 + x/a + y/b + z/c)$

○ C: $xyz\,(1 + x + y + z)$　　○ D: $xyz\,(1 + a + b + c)$

Let A = $\begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$

8. If $|A|^2 = 25$, then $|\alpha|$ is equal to

○ A: 1/5q

○ B: 5

○ C: 1

○ D: 25

9. If A = $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ such that $A + A^C = I$, then value of α is

○ A: $\pi/6$

○ B: $\pi/3$

○ C: π

○ D: 0

10. Which is the following is the condition for a Skew Hermitian matrix?

○ A: $(\bar{A})^t = A$

○ B: $(\bar{A})^t = A^2$

○ C: $(\bar{A})^t = -A$

○ D: $\bar{A}^t = -A^2$

11. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$, where a = i, b = ω, c = ω^2, then Δ is equal to

○ A: I

○ B: -1

○ C: 1

○ D: -i

12. If f(x) = $\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$, then f(100) is equal to

○ A: 0

○ B: 1

○ C: 100

○ D: -100

13. The solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$ is

○ A: 1, 2, 3

○ B: 1, 2, -3

○ C: -1, 2, 3

○ D: -1, -2, 3

14. Which of the following is true for Echelon Form of a Matrix?

○ A: In any row, the number of zeros before the leading entry is greater than the number of such zeros in the preceding row.

○ B: All non zero rows preceeds row including zeros.

○ C: First entry in any non zero row is 1.

○ D: All of the above.

15. The matrix $A = \begin{bmatrix} 1 & 1-i \\ 1+i & 2 \end{bmatrix}$ **is a?**

○ A: Symmetric Matrix

○ B: Hermitian Matrix

○ C: Skew symmetric matrix

○ D: Skew hermitian matrix

16. The value of the determinate $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

○ A: 5√3 (-√6 – 5)
○ B: 5√3 (√6 – 5)
○ C: 5√3 (5 - √6)
○ D: √3 (√6 – 5)

17. If A and B are symmetric matrices, then AB would equal to?

○ A: -BA
○ B: BA
○ C: 0
○ D: I

18. In reduced echelon form of the matrix if first non zero entry of a row lies in Column j, all other entries in the column are?

○ A: Positive
○ B: Negative
○ C: Zero
○ D: None of the above.

TEST 4

1. For the matrix below find the |A|?

$$A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

○ A: 30
○ B: 40
○ C: 50
○ D: 60

2. A triangular matrix is always a?

○ A: Echelon form of Matrix.
○ B: Reduced Echelon form of Matrix.
○ C: Square matrix.
○ D: Non of the above.

3. What is the conjugate of matrix $A = \begin{bmatrix} i & 10+i \\ -2i & 1-i \end{bmatrix}$

○ A: $\begin{bmatrix} -i & 10+i \\ -2i & 1+i \end{bmatrix}$
○ B: $\begin{bmatrix} i & 10-i \\ 2i & 1-i \end{bmatrix}$
○ C: $\begin{bmatrix} -1 & 10-i \\ 2 & 1+i \end{bmatrix}$
○ D: $\begin{bmatrix} -i & 10-i \\ 2i & 1+i \end{bmatrix}$

4. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

○ A: α=1
○ B: α=0
○ C: α=-1
○ D: None of these.

5. **The matrix A = $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ can be described as?**

○ A: Hermitian
○ B: Skew Hermitian
○ C: Symmetric
○ D: Skey Symmetric.

For a system of equations,

$x + 3y + 2z = 3$

$4x + 5y - 3z = -3$

$3x - 2y + 17z = 42$

6. **Fine the values of x, y and z if the echelon form of matrix is $\begin{bmatrix} 1 & 3 & 2 & : 3 \\ 0 & 1 & -1 & : -3 \\ 0 & 0 & 1 & : 2 \end{bmatrix}$**

○ A: x = 2 ; y = -1; z = 2
○ B: x = -2 ; y= 1; z= 2
○ C: x = 4 ; y = -1; z = 2
○ D: x= 2 ; y =-2; z = 2

7. **Find the value of a if the following matrix is singular $\begin{bmatrix} -4 & 2 \\ -6 & a \end{bmatrix}$**

○ A: -3
○ B: 3
○ C: 5
○ D: -5

8. **If A=$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A is symmetric then?**

○ A: x=0, y=5
○ B: x+y=5
○ C: x=y
○ D: None of the above.

9. **Let** $A = \begin{vmatrix} 1 & bc & a(b+c)) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b)) \end{vmatrix}$**. Value of A is equal to?**

○ A: ab + bc +ca
○ B: a + b + c
○ C: $(a + b + c)^2$
○ D: None of the above

10. **If in a square matrix A two rows or two columns are interchanged the determinant of the resulting matrix is?**

○ A: A^{-1}
○ B: -|A|
○ C: |A|
○ D: None of the above.

11. **What is the rank of the matrix** $A = \begin{bmatrix} 1 & 0 & 7 & -2 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

○ A: 1
○ B: 2
○ C: 3
○ D: 4

12. What is value of the determinant $A = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{vmatrix}$

○ A: 25 ○ B: -25

○ C: 30 ○ D: -30

13. If ω is the cube root of unity then the value of is ?

○ A: $a^3 + b^3 + c^3$ ○ B: ab - bc

○ C: 0 ○ D: $a^3 + b^3 + c^3$ -3abc

14. If x + ay = 0; y + az = 0; z + ax = 0, then the value of 'a' for which the system of equations will have infinite number of solutions is?

○ A: 1 ○ B: 0

○ C: -1 ○ D: None of these.

Quadratic Equations

TEST 1

1. Find the value of x where $9x^2 - 12x - 5 = 0$.

○ A: -1/3 , 5/3
○ B: -2/3 , 5/3
○ C: -1/3, 2/3
○ D: 2/3 , 5/3

2. $\omega^{-12} = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: 0

3. If x-a is a factor of f(x) then f(a) = ?

○ A: a
○ B: 0
○ C: 1
○ D: w

4. Solution to the equation $6x^2 + x - 15 = 0$ is?

○ A: 3/2 , -3/2
○ B: 6/7 , -4/5
○ C: 3/2 , -5/3
○ D: None of the above.

5. Roots of the equation $2x^2 + 5x - 1$ are?

○ A: Complex
○ B: Irrational
○ C: Equal
○ D: Rational

6. The condition for polynomial equation $ax^2 + bx + c = 0$ to be quadratic is?

○ A: $a > 0$
○ B: $a < 0$
○ C: $a \neq 0$
○ D: $a \neq 0$ and $b \neq 0$

7. If the product of the roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, the value of m is?

○ A: 1
○ B: -1
○ C: 1/3
○ D: -1/3

8. Quadratic equations are?

○ A: First degree polynomials.
○ B: Second degree polynomials.
○ C: Third degree polynomials.
○ D: Fourth degree polynomials.

9. $1 + \omega + \omega^2 = ?$

○ A: 1
○ B: ω
○ C: ω^2
○ D: 0

10. For quadratic equation $ax^2 + bx + c = 0$, Sum of roots is equal to?

○ A: b/a
○ B: -b/a
○ C: c/a
○ D: -c/a

11. If S and P are the sum and products of the roots of the quadratic equation, then the equation may be written as?

○ A: $x^2 + Sx + P = 0$
○ B: $x^2 - Sx - P = 0$
○ C: $x^2 - Sx + P = 0$
○ D: $x^2 + Sx - P = 0$

12. Roots of the equation $x^2 + 7x + 12$ are?

○ A: 3, 4 ○ B: -3, 4

○ C: 3, -4 ○ D: -3, -4

13. Sum of all fourth roots of unit is?

○ A: 1 ○ B: -1

○ C: 0 ○ D: i

14. Product of all fourth roots of unity are?

○ A: 1 ○ B: -1

○ C: 0 ○ D: i

15. $\frac{-1+\sqrt{3}i}{2} * \frac{-1-\sqrt{3}i}{2}$ **= ?**

○ A: $\frac{-1+\sqrt{3}i}{2}$ ○ B: $\frac{-1-\sqrt{3}i}{2}$

○ C: 1 ○ D: 0

16. The solution for equation $x^2 - x = 2$ is?

○ A: 1 , -2 ○ B: -1, 4

○ C: 2, -1 ○ D: 2, -3

TEST 2

1. The degree of the equation $x^4 + 1/ x^4 - 3 = 0$ is?

○ A: 4
○ B: 6
○ C: 8
○ D: None of the above.

2. $x + 2$ is a factor of ?

○ A: $x^4 + 2$
○ B: $x^4 - x^2 + 12$
○ C: $x^4 - 2x^3 - x + 2$
○ D: $x^4 + 2x^3 - x - 2$

3. If the equation $x^3 + 4x^2 - 2x + 5$ is divided by $x-1$ the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

4. $\omega^{-5} = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: None of the above.

5. The equation $\sqrt{x+3} + \sqrt{x+5} = \sqrt{3x+2}$ is called?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal equation
○ D: Square root equation.

6. The equation $2^{2x} + 4^x - 10 = 0$ is?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal
○ D: None of the above.

7. Out of the three cube roots of unit, how many are imaginary?

○ A: 1
○ B: 2
○ C: 3
○ D: Zero

8. If ω is the complex cube root of unity then $\omega = ?$

○ A: 0
○ B: 1
○ C: ω^2
○ D: ω^{-1}

9. If $x^2 + 1/x^2 = 27$, then the value of $x - 1/x$ is equal to ?

○ A: 5
○ B: 4
○ C: 3
○ D: 2

10. If the equation $x^3 + 4x^2 - 2x + 5 = 0$ is divided by $x+1$ the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

11. If one root of the equation $x^2 + px + q = 0$ is double the other, p^2/q is?

○ A: 1
○ B: 1/2
○ C: 2/9
○ D: 9/2

12. Roots of the equation $x^2 + 2x + 3 = 0$ are?

○ A: Unequal
○ B: Real
○ C: Complex
○ D: Both A & C.

13. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is?

○ A: 12
○ B: 4
○ C: 23/6
○ D: 49/4

14. $1/\omega = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: 0

15. If the roots of $ax^2 + b = 0$ are real and distinct, then?

○ A: $ab > 0$
○ B: $a = 0$
○ C: $a > 0$ and $b < 0$
○ D: $ab < 0$

16. If $b^2 - 4ac$ for a quadratic equation is a perfect square the roots are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of these.

17. Cube roots of 8 are?

○ A: $-2, -2w$ and $-2w^2$
○ B: $2, 2w$ and $2w^2$
○ C: $2, w$ and w^2
○ D: $1, w$ and w^2

18. The roots of the equation $9x^2 - 12x + 4 = 0$ are?

○ A: Equal
○ B: Complex
○ C: Irrational
○ D: Unequal

19. If j and k are the roots of the equation $2x^2 - 4x + 5 = 0$ then $(j+1)(k+1) = ?$

○ A: 11/2
○ B: -11/2
○ C: 2/11
○ D: -2/11

20. $x^4 - 2x^3 + 8x^2 - 2x + 1$ is called?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal equation
○ D: None of the above.

TEST 3

1. **$(1 + w - w^2)^8$ = ? where w is cube root of unity**.

○ A: $256w^2$
○ B: $-256w^2$
○ C: 256w
○ D: -256w

2. **For what value of m the given equation would have equal root.**

$(m + 1)x^2 + 2(m+3)x + m + 8 = 0$

○ A: ½
○ B: 1/3
○ C: -1/3
○ D: 2/3

3. **The number of real solutions of $|x|^2 + 3|x| + 2 = 0$ is?**

○ A: 1
○ B: 2
○ C: 3
○ D: 0

4. **The roots of equation $x^2 + k = 0$, $k < 0$, are?**

○ A: Complex conjugates
○ B: Real and distinct
○ C: Real and same
○ D: Rational

5. **The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is**

○ A: 2
○ B: -2
○ C: 0
○ D: None of these.

6. **If the roots of the equation $ax^2 + bx + c = 0$ are such that their sum is equal to the sum of their squares, then?**

○ A: $2ac = ab + b^2$
○ B: $2ac = a^2 + b^2$
○ C: $2ac = ab + b^3$
○ D: None of the above.

If α, β be the roots of $x^2 - 2x + 4 = 0$, $(\alpha^5 + \beta^5)$ = ?

Hint: $(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$.

○ A: 243
○ B: 81
○ C: 64
○ D: 32

7. **If the equation $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a common non-zero root, the value of λ is?**

○ A: -1
○ B: 1
○ C: 3
○ D: -3

8. **The number of real roots of $(x + 1/x)^3 + (x + 1/x) = 0$ is**

○ A: 0
○ B: 2
○ C: 4
○ D: 6

9. **If $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, the value of (a + b) is?**

○ A: 1
○ B: -1
○ C: 2
○ D: 1/2

10. **If α and β are the roots of the equation $ax^2 + bx + c$, what is equation with roots 1/α and 1/β?**

○ A: $cy^2 + by - a = 0$
○ B: $cy^2 - by - a = 0$
○ C: $y^2 + by + a = 0$
○ D: $cy^2 + by + a = 0$

11. If $x = (3 + \sqrt{5})$, the value of $(2x^3 - 9x^2 - 10x + 13)$ is ?

○ A: 0
○ B: 1
○ C: $12\sqrt{5}$
○ D: None of the above.

12. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3$ is equal to

○ A: -1
○ B: 0
○ C: 1
○ D: 2

13. If one root of the equation $ax^2 + bx + c = 0$ is twice the other, then?

○ A: $2b^2 = 9ac$
○ B: $b^2 = 4ac$
○ C: $b^2 = 9ac$
○ D: $3b^2 = ac$

14. Only one of the root of the equation $ax^2 + bx + c = 0$, is zero, and $a \neq 0$ if,

○ A: $c = 0$
○ B: $c = 0$ and $b \neq 0$
○ C: $b = 0$ and $c = 0$
○ D: $b \neq 0$ and $c \neq 0$

15. If α and β are the roots of equation $ax^2 + bx + c = 0$ the value of $\alpha^2 + \beta^2$ is?

○ A: $\frac{b^2 + 2ca}{a^2}$
○ B: $\frac{b^2 - 2ca}{a}$
○ C: $\frac{b^2 - 2ca}{a^2}$
○ D: $\frac{b - 2ca}{a^2}$

16. If $a > 0$ and $x = \sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \ldots\ldots\ldots\ldots\infty}}}}$, the value of x is

○ A: $\frac{\sqrt{4a - 1}}{2}$
○ B: $\frac{1 \pm \sqrt{4a + 1}}{2}$
○ C: $\frac{-1 \pm \sqrt{4a + 1}}{2}$
○ D: $\frac{-2 \pm \sqrt{4a + 1}}{2}$

17. The roots of the equation $3^{2x+3} + 37 = 10(73.3^x + 1)$ are?

○ A: 2, -2
○ B: 3 , -3
○ C: 8 , 1/9
○ D: 3 , 1/3

18. Roots of the equation $x^2 + 5x - 1 = 0$ are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of the above.

19. If $\alpha + \beta = 4$ and $\alpha^3 + \beta^3 = 44$, α, β are the roots of ?

○ A: $2x^2 - 7x + 16 = 0$
○ B: $3x^2 + 9x + 11 = 0$
○ C: $9x^2 - 27x + 20 = 0$
○ D: None of the above.

TEST 4

1. **The equation $x^5 + x^3 + 2x + 1 = 0$ has**

   ○ A: No positive roots
   ○ B: Some positive roots
   ○ C: No negative roots
   ○ D: None of the above.

2. $(-1+\sqrt{-3})^4 + (-1-\sqrt{-3})^4 = ?$

   ○ A: 16ω
   ○ B: -16
   ○ C: 16
   ○ D: $16\omega^2$

3. **For quadratic equations, If $b^2 - 4ac$ is a perfect square then the roots are?**

   ○ A: Rational
   ○ B: Irrational
   ○ C: Equal
   ○ D: Complex

4. **The number of real roots of the equation $x^6 - 7x^3 - 8 = 0$ is?**

   ○ A: 1
   ○ B: 2
   ○ C: 3
   ○ D: 6

5. **If $x^3 + kx^2 -7x + 6$ is divided by $x + 2$, the remainder is -8. The value of k is?**

   ○ A: 5
   ○ B: -5
   ○ C: 1
   ○ D: -1

6. **If the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 58$ is divided by $(x - 2)$, then the quotient must be?**

   ○ A: $x^3 + 5x^2 + 17$
   ○ B: $x^3 + 3x + 5$
   ○ C: $x^3 + 7x^2 + 17x + 29$
   ○ D: $x^3 + 17x + 29$

7. **If $x^3 + x^2 + x + 1 = 0$ then possible values of x are?**

   ○ A: 1, i, -I
   ○ B: -1, i^2, -i
   ○ C: -1, i, -I
   ○ D: None of the above.

8. **If $x + 1/x = 1$ then $x^3 + 1/x^3$ is equal to**

   ○ A: 1
   ○ B: -1
   ○ C: 2
   ○ D: -2

9. **If two of the four roots of 625 are 5 and 5i then the other two roots are?**

   ○ A: -5, -5i
   ○ B: 5, 5i
   ○ C: -25, -25i
   ○ D: None of the above.

10. **$(x + \omega y) . (x + \omega^2 y) = ?$**

    ○ A: $x^2 - 2xy + y^2$
    ○ B: $x^2 + 2xy + y^2$
    ○ C: $x^2 + xy + y^2$
    ○ D: $x^2 - xy + y^2$

11. **If 5 + i be one of the roots of a given equation $f(x) = 0$ with real coefficients, then the lowest degree of such an equation must be?**

    ○ A: 2
    ○ B: 3
    ○ C: 6
    ○ D: Not enough information given to answer the question.

12. $\left(\frac{-1-\sqrt{3}i}{2}\right)^2$ = ?

○ A: $\left(\frac{-1+\sqrt{3}i}{2}\right)$

○ B: 1

○ C: $\left(\frac{-1+i}{2}\right)$

○ D: $\left(\frac{-1-i}{2}\right)$

13. If α, β are the roots of the equation $x^2 + x + 1 = 0$, the equation whose roots are α / β and β / α is?

○ A: $x^2 + x + 1 = 0$

○ B: $x^2 - x + 1 = 0$

○ C: $x^2 + x - 1 = 0$

○ D: $x^2 - x - 1 = 0$

14. $1 + \omega^4$ = ?

○ A: $1 + \omega$

○ B: $-\omega^2$

○ C: 1

○ D: Both A and B.

15. if $x + y = 7$ and $x^2 - xy + y^2 = 13$; What are the values of x and y?

○ A: (1,2) (-1,3)

○ B: (4,5) (-2,3)

○ C: (1,5) (2,5)

○ D: (4,3) (3,4)

16. An expression of the type $a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0 = 0$ is called

○ A: Polynomial of degree

○ B: Polynomial of degree 1

○ C: Polynomial of degree 2

○ D: Polynomial of degree n

17. If the equations $x^2 + ax + b = 0$ and $x^2 + Ax + B = 0$ have a common root say ' t ', ' t ' must be equal to?

○ A: (B - b) / (a - A)

○ B: (a - A) / (b - B)

○ C: (a + A) / (B - b)

○ D: None of the above.

18. If $2 + i\sqrt{3}$ is a root of the equation $x^2 + p x + q = 0$ (p & q being real), then p + q is equal to?

○ A: 3

○ B: -3

○ C: $\sqrt{3}$

○ D: $-\sqrt{3}$

19. The roots of the equation $12x^2 + mx + 5 = 0$ will be in the ratio 3 : 2, if m is equal to

○ A: 1/12

○ B: 5/12

○ C: $5\sqrt{10}$

○ D: $5/12\sqrt{10}$

Sequences & Series

TEST 1

1. **If a series has a common ratio between two terms. It is called?**

○ A: Geometric series.
○ B: Arithmetic series
○ C: Harmonic series
○ D: None of the above.

2. **Sum of infinite GP does not exist if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: Both B & C.

3. **Sum of infinite geometric series exists if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

4. **If the sum of first n positive integers is 1/5 times the sum of their square. Then n equals?**

○ A: 5
○ B: 6
○ C: 7
○ D: 8

5. **Find next term for the series,**
1, -3, 5, -7, 9, ?

○ A: -9
○ B: -11
○ C: -13
○ D: -15

6. **If AP has a=1, $t_n = 20$ and $S_n = 399$, then the value of n is?**

○ A: 20
○ B: 32
○ C: 38
○ D: 40

7. **The 6th term of HP is 1/61 and tenth term is 1/105. The first term of HP is?**

○ A: 1/39
○ B: 1/28
○ C: 1/17
○ D: 1/6

8. **What are the number of terms in an AP if $a_1=3$, d=7 and $a_n=59$.**

○ A: 6
○ B: 7
○ C: 8
○ D: 9

9. **If first two terms of H.P are 1/2 and 1/4 then fourth term is?**

○ A: 1/6
○ B: 1/8
○ C: 1/10
○ D: 1/12

10. **Write the first four terms of the arithmetic sequence if $a_1 = 5$ and other three consecutive terms are** 23,26,29.?

○ A: 5, 10, 15, 20
○ B: 5,8,11,14
○ C: 5, 9, 13, 17
○ D: None of the above.

11. 3, 6, 12 is?

○ A: AP
○ B: GP
○ C: HP
○ D: None of the above.

12. 5th term of the GP 3, 6, 12 is?

○ A: 32
○ B: 36
○ C: 42
○ D: 48

13. If the first and the sixth terms of a G.P are 2 and 64, then its common ratio is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

14. If $x = 1 + y + y^2$ .... infinity. The value of y is?

○ A: $x / (x-1)$
○ B: $x / (1-x)$
○ C: $(x-1) / x$
○ D: $(1-x) / x$

15. Arithmetic mean is given by formula?

○ A: $(ab)^{1/2}$
○ B: $ab / (a + b)$
○ C: $(a + b) / 2$
○ D: None of the above.

16. Arithmetic mean between $1 - x + x^3$ and $1 + x + x^3$ is?

○ A: $1 + x^3$
○ B: $1 - x^3$
○ C: $1 + x$
○ D: $1 - x$

17. nth term of GP is given by formula?

○ A: $a_n=a_1r^n$
○ B: $a_n=a_1r^{n+1}$
○ C: $a_n=a_1r^{n-1}$
○ D: $a_n=a_1r^{n-2}$

18. The harmonic mean of $a / (1 - ab)$ and $a / (1 + ab)$ is?

○ A: $a / (1 - ab)$
○ B: $a / (1 - a^2b^2)$
○ C: a
○ D: $1 / (1 - a^2b^2)$

19. An infinite GP is oscillatory if?

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

20. What is the geometric mean between -2i and 8i?

○ A: ±4
○ B: ±4i
○ C: 3i
○ D: 8i

TEST 2

1. If the numbers a, b, c, d, e form an A.P then the value of $a - 4b + 6c - 4d + e$ is?

○ A: 1
○ B: 2
○ C: 0
○ D: None of the above.

2. $\sum_{k=1}^{n} k^2 = ?$

○ A: n
○ B: n(n+1) / 2
○ C: n(n+1)(2n+1) / 6
○ D: $[\ n(n+1)/2\ ]^2$

3. If 5 is HM between 2 and b then the value of b is?

○ A: 12.5
○ B: 10
○ C: -10
○ D: 8

4. What is the common ratio if $a_4 = 8/27$ and $a_7 = -64/729$?

○ A: ¼
○ B: -1/3
○ C: -2/3
○ D: -3/7

5. If x, y, z are in A.P, then $(x + 2y - z)(2y + z - x)(z + x - y) = ?$

○ A: xyz
○ B: 2xyz
○ C: 4xyz
○ D: 6xyz

6. If $|x| < 1$ and $y = x + x^2 + x^3 + \dots \infty$, then x is equal to?

○ A: 0
○ B: xy
○ C: y / (1-y)
○ D: y / (1+y)

7. The sum of the series $\sqrt{3} + 1/\sqrt{3} + 1/3\sqrt{3}$ .... ∞ is equal to ?

○ A: √3 / 2
○ B: 3√3 / 2
○ C: 3
○ D: √3

8. If a, b, c are in A.P as well as in G.P then?

○ A: $a = b \neq c$
○ B: $a \neq b = c$
○ C: $a \neq b \neq c$
○ D: $a = b = c$

9. The nth terms of the two series: 3 + 10 + 17 + ------- and 63 + 65 + 67+......... are equal. Then the value of n is?

○ A: 9
○ B: 13
○ C: 19
○ D: 21

10. If the quadratic equation $(b^2 + c^2)x^2 - 2(a + b)cx + (c^2 + a^2) = 0$ has equal roots, then

○ A: a, b, c are in G.P
○ B: a, b, c are in A.P
○ C: a, c, b are in G.P
○ D: a, c, b are in A.P

The harmonic mean of the roots of the equation

11. $(5+\sqrt{2})x^2 - (4+\sqrt{5})x + 8 + 2\sqrt{5} = 0$ **is**

○ A: 2

○ B: 4

○ C: 6

○ D: 8

12. If $a_n = (-3)\ (2/5)^n$ what the value of a_1 and r for the GP?

○ A: -6/5 and 2/5

○ B: 6/5 and 2/5

○ C: 3/8 and 1/5

○ D: -3/8 and 1/5

13. If in an AP $a_{25} - a_{20} = 45$, then d is equal to?

○ A: 9

○ B: -9

○ C: 18

○ D: 23

14. If $\frac{1}{x+y}$, $\frac{1}{2y}$, $\frac{1}{y+z}$ are in H.P, then x, y, z are in

○ A: A.P

○ B: G.P

○ C: H.P

○ D: None of the above.

15. For AP $T_{18} - T_8 = ?$

○ A: d

○ B: 2d

○ C: 10d

○ D: 26d

16. The value of the recurring fraction $0.0\overline{102}$ **is?**

○ A: 17 / 1665

○ B: 102 / 9999

○ C: 102 / 10000

○ D: 34 / 3339

17. The value of $(1^3 + 2^3 + 3^3 + \text{............} + 100^3)^{1/2} \div 100$ is?

○ A: √100

○ B: 100

○ C: 100.5

○ D: 50.5

18. If a, b, c, d, e, f are A.Ms (Arithmetic Means) between 2 and 12, then a + b + c + d + e + f is equal to?

○ A: 14

○ B: 42

○ C: 64

○ D: 82

19. The number of terms between 30 and 530, which are divisible by 11, is?

○ A: 30

○ B: 40

○ C: 46

○ D: 52

20. Find the sum of infinite GP 2, √2, 1 .....

○ A: 4 + √2

○ B: 2 + 2√2

○ C: 4 + 2√2

○ D: 2+ 7√2

TEST 3

1. If $a^x = b^y = c^z = d^t$ and a, b, c, d are in G.P then x, y, z, and t are in?

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

2. If a^2, b^2, c^2 are in A.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in

○ A: G.P ○ B: H.P

○ C: A.P ○ D: None of the above.

3. If mth term of H.P is n and nth term is m, then (m+n)th term is?

○ A: mn / (m+n) ○ B: m / (m+n)

○ C: n / (m+n) ○ D: (m-n) / (m+n)

4. If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

5. If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then a, b, c, d are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

6. If m

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

7. If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, and $b \neq a + c$, then a, b, c are

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

8. If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} (ab)^n$, where $|a|, |b| < 1$, then

○ A: xyz = x + y + z ○ B: xy + z = xz + yz

○ C: xy + yz = xz + y ○ D: xy + xz = yz + x

9. If $a^x = b^y = c^z$ and a, b, c are in G.P then x, y, z are in?

○ A: A.P ○ B: H.P

○ C: G.P ○ D: None of the above.

10. If a, b, c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point and that point is

○ A: (-1. -2) ○ B: (-1, 2)

○ C: (1, -2) ○ D: (1, 2)

11. The harmonic mean of two numbers is 4. Their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 27$, the numbers are

○ A: 2, 15 ○ B: 9, 12

○ C: 6, 3 ○ D: 4, 8

12. Between 1 and 31 are inserted m arithmetic means, so that the ratio of the 7th and $(m-1)$th means is 5 : 9. Then the value of m is

○ A: 12 ○ B: 13

○ C: 14 ○ D: 15

13. If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to

○ A: 75 ○ B: 430

○ C: 864 ○ D: 900

14. If the sum of an infinite G.P is 3 and the sum of the squares of its terms is also 3, then its first term and common ratio are?

○ A: 3/2, ½ ○ B: 4/7, 1/3

○ C: 1, 1/2 ○ D: 1/8, 3/8

15. If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P., then

○ A: p, q, r are in A.P ○ B: q^2, p^2, r^2 are in A.P

○ C: p^2, q^2, r^2 are in A.P ○ D: p, r, q are in A.P

16. If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x \, dx$, then $I_1, I_2, I_3, \ldots\ldots$ are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

17. The sum of integers from 1 to 100 which are not divisible by 3 or 5 is?

○ A: 2438 ○ B: 4745

○ C: 2317 ○ D: 2632

18. The sum of all the odd numbers of four digits which are divisible by 9 is ?

○ A: 11007000 ○ B: 4362000

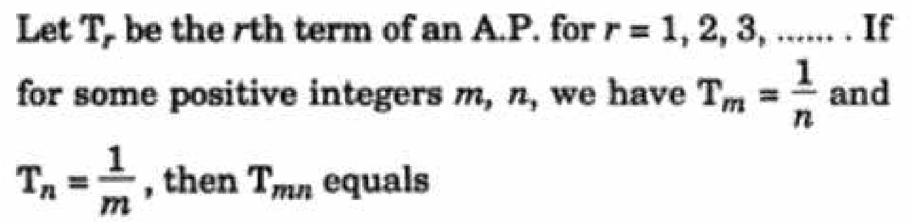
○ C: 6743000 ○ D: 2754000

19. The sum of 100 terms of the series $1^2 - 2^2 + 3^2 - 4^2 + \dots\dots$ is?

○ A: -5050 ○ B: -4720

○ C: -3870 ○ D: -2490

20.



Let T_r be the rth term of an A.P. for $r = 1, 2, 3, \dots\dots$. If for some positive integers m, n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then T_{mn} equals

○ A: 1 ○ B: 0

○ C: 1 / mn ○ D: 1/m + 1/n

TEST 4

1. $1 + 2 + 3 + 4 + \ldots n =$?

○ A: n
○ B: n(n+1) / 2
○ C: n(n+1) / 6
○ D: n(n+1)(2n+1) / 6

2. If 5 and 8 are two AMs between a and b. What is the value of a and b?

○ A: 3, 14
○ B: 2, 11
○ C: 4, 13
○ D: 2, 16

3. If a, b, c, d, e, f are in arithmetic progression, then e - c = ?

○ A: 2(c - a)
○ B: 2(d - c)
○ C: 2(f - d)
○ D: d - c

4. If a_{n-2} term of an AP is 3n-11. What is the nth term of the sequence?

○ A: 2n – 8
○ B: 3n + 8
○ C: 3n – 5
○ D: 7n + 12

5. If $|r| < 1$ then the sum of n terms of GP are given by?

○ A: $S_n = a_1 (1 + r^n) / (1 - r)$
○ B: $S_n = a_1 (1 - r)^n / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (1 - r^n) / (1 + r)$

6. **The first term of an A.P of consecutive numbers is $p^2 + 1$. The sum of 2p + 1 terms of this series can be expressed as?**

○ A: $(p+1)^2$
○ B: $(p+1)^3$
○ C: $(2p +1) * (p+1)^2$
○ D: $p^3 + (p+1)^3$

7. The sum of first n terms of the series 1/2 + 3/4 + 7/8 + 15/16 + ... is equal to?

○ A: $2^n - n + 1$
○ B: $1 - 2^n$
○ C: $n + 2^{-n} – 1$
○ D: $2^n - 1$

8. The value of $0.4\overline{23}$ is

○ A: 419 / 999
○ B: 419 / 990
○ C: 423 / 1000
○ D: None of the above.

9. If $|r| > 1$ then the sum of n terms in a GP are given by formula?

○ A: $S_n = a_1 (r^n – 1) / (r + 1)$
○ B: $S_n = a_1 (r^n – 1) / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (r^n – 1) / (r - 1)$

10. Fine the 7th term of the series 2, 6, 11, 17, ...

○ A: 41
○ B: 47
○ C: 53
○ D: 62

11. Arithmetic mean between $3\sqrt{5}$ and $5\sqrt{5}$ is?

○ A: $4\sqrt{5}$
○ B: $8\sqrt{5}$
○ C: $5\sqrt{15}$
○ D: $15\sqrt{5}$

12. Harmonic mean between 3 and 7 is?

○ A: 7/3
○ B: 3/7
○ C: 21/5
○ D: 32/7

13. If k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an A.P, then k is equal to?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

14. If sum of the series $1 + \frac{3}{x} + \frac{9}{x^2} + \frac{27}{x^3} + \ldots \infty$ is a finite number, then

○ A: $x < 3$
○ B: $x > 1/3$
○ C: $x < 1/3$
○ D: $x > 3$

15. If G.P consists of even number of terms and sum of all terms is equal to 5 times the sum of terms in odd places (meaning term 1, 3, 5, ...) then common ratio will be?

○ A: 3
○ B: 4
○ C: 5
○ D: 6

16. If a series has common difference between two consecutive numbers. It is called?

○ A: Geometric progression
○ B: Arithmetic progression
○ C: Harmonic progression
○ D: None of the above.

17. Which term of the AP 92, 88, 84, 80 ... is zero?

○ A: 22
○ B: 23
○ C: 24
○ D: 34

18. The angles of a triangle are in A.P. If the least angle is 30^0 the greatest angle is?

○ A: 45^0
○ B: 60^0
○ C: 75^0
○ D: 90^0

19. If a, b, c are in A.P, b - a, c - b and a are in G.P, then a : b : c is ?

○ A: 1:2:3
○ B: 1:4:9
○ C: 2:3:4
○ D: 1:2:4

20. If n arithmetic means are added between 2 and 38 and the sum of resulting series is 200. Then the value of n is?

○ A: 6
○ B: 8
○ C: 9
○ D: 10

Probability & Permutations

TEST 1

1. If there are 3 roads from Lahore to Gujranwala and 4 roads from Gujranwala to Islamabad. How many different routes are there from Lahore to Islamabad?

○ A: 4 ○ B: 10

○ C: 12 ○ D: 18

2. If $^nC_8 = {}^nC_{12}$, What is value of n?

○ A: 5 ○ B: 10

○ C: 20 ○ D: Cannot be determined.

3. If the probability to score a century in any given match is 0.04. How many centuries the batsmen would make in 50 matches?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

4. When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is?

○ A: 1/216 ○ B: 8/27

○ C: 130/216 ○ D: 125/216

5. A club has 20 members and you want to select the president and vice president for the club. How many different outcomes are possible if president and vice president cannot be the same person?

○ A: 370 ○ B: 380

○ C: 390 ○ D: 398

6. There are n points on a circle. The number of straight lines obtained by joining them is?

○ A: $^nC_3$ ○ B: $^nC_2$

○ C: $^nC_2 - n$ ○ D: ^nC_n

7. Probability of occurance for one of the four equally likely events would be?

○ A: 0 ○ B: 0.25

○ C: 0.75 ○ D: 1

8. What is the probability of getting a sum 9 from two throws of a dice?

○ A: 1/6 ○ B: 1/8

○ C: 1/9 ○ D: 1/12

9. The number of ways of painting the faces of a cube with six different colours is?

○ A: 1 ○ B: 6

○ C: 6! ○ D: None of the above.

10. Which of the following is true?

n! = n(n-1)!, 0! = 0, 4! = 4.3.2.1

○ A: iii only ○ B: i and ii only

○ C: i and iii only ○ D: i, ii and iii

11. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

○ A: 5/7 ○ B: 2/7

○ C: 3/5 ○ D: 2/5

12. A husband and a wife appear in an interview for the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that none of them will be selected?

○ A: 12/35 ○ B: 34/35

○ C: 24/35 ○ D: None of the above.

13. If you role a dice twice. What is the probability that you would get 6 both the times?

○ A: 1/3 ○ B: 1/6

○ C: 1/12 ○ D: 1/36

14. If A and B are two independent sets then P(A∩B) = ?

○ A: P(A) + P(B) ○ B: P(A) * P(B)

○ C: P(A) + P(B) – P(AuB) ○ D: P(A)

15. The number of diagonals of a hexagon is?

○ A: 6 ○ B: 9

○ C: 15 ○ D: 18

16. The number of ways of selecting 2 candidates out of 5 equally qualified candidates for a post is?

○ A: 10 ○ B: 8

○ C: 5 ○ D: 20

17. P, Q, R and S are to give lectures to an audience. The organizer can arrange the order of their presentations in how many ways?

○ A: 4 ○ B: 8

○ C: 12 ○ D: 24

18. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: (p+q)! ○ B: (p+q)! / p!

○ C: (p+q)! / q! ○ D: (p+q)! / p!q!

19. A set with all possible outcomes of an experiment is called?

○ A: Probability function ○ B: Event space

○ C: Sample space ○ D: Both B and C.

20. 9! / (6!3!) = ?

○ A: 72 ○ B: 84

○ C: 96 ○ D: 108

TEST 2

1. The total number of different combinations of names which can be made from the letters of the word MISSISSIPPI, using all the letters at a time?

○ A: 4!x 4!x 2!
○ B: 11! / (4!x 4!x 2!)
○ C: 11! / (10!)
○ D: 11!

2. A work is given to 3 men and their probabilities for doing the work are 1/7, 1/4, 1/6 respectively. Find the probability that the work is done?

○ A: 39/84
○ B: 1/168
○ C: 167/168
○ D: 23/89

3. Three identical dice are rolled. The probability that the same number will appear on each of them is?

○ A: 1/6
○ B: 1/36
○ C: 1/216
○ D: 3/216

4. The number of subsets of a set containing n distinct objects is?

○ A: ${}^nC_1 + {}^nC_2 + {}^nC_3 + ... + {}^nC_n$
○ B: ${}^nC_0 + {}^nC_1 + {}^nC_2 +..... + {}^nC_n$
○ C: $2^n + 1$
○ D: None of the above.

5. The odds against drawing 2 red balls from a bag containing 3 red and 2 white balls is?

○ A: 1 : 2
○ B: 3 : 7
○ C: 7 : 3
○ D: 3 : 2

6. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that either Hafeez or Afridi would face the first ball?

○ A: 2/11
○ B: 1/11
○ C: 1/121
○ D: 1/110

7. There are 8 persons in the room. 4 are men and 4 are women. If two persons are selected, what is the probability that both of them would be men?

○ A: ½
○ B: 1/4
○ C: 3/7
○ D: 3/14

8. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is?

○ A: 21/46
○ B: 25/117
○ C: 1/50
○ D: 3/23

9. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that neither Hafeez nor Afridi would face the first ball?

○ A: 2/11
○ B: 1/11
○ C: 9/11
○ D: 10/11

10. An rack has 5 black and 4 white ties. A boy pulls out 2 ties at random. The probability that 2 are of the same colour is?

○ A: 4/9
○ B: 5/9
○ C: 5/8
○ D: 3/8

11. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

○ A: 1/14 ○ B: 1/8

○ C: ¾ ○ D: 4/7

12. For any two events A and B, $P(A \cap B)$ is?

○ A: Less than $P(A) + P(B) - 1$ ○ B: Greater than $P(A) + P(B)$

○ C: $P(A) + P(B) - P(A \cup B)$ ○ D: $P(A) + P(B) + P(A \cup B)$

13. The probability that a man will live 10 more years is 1/4 and the probability that his wife will live 10 more years is 1/3. The probability that neither of them will be alive in 10 years is?

○ A: 1/12 ○ B: 11/12

○ C: 7/12 ○ D: 1/2

14. A box contains 2 white, 3 black and 4 red balls. The number of ways in which 3 balls can be drawn from the box, so that at least one of the balls is black is?

○ A: 45 ○ B: 84

○ C: 64 ○ D: 32

15. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

○ A: 10/21 ○ B: 11/21

○ C: 2/7 ○ D: 5/7

16. The chances of wining of two race horses are 1/3 and 1/6 respectively. What is the probability that atleast one will win, when the horses are running in different races?

○ A: ½ ○ B: 1/8

○ C: 1/18 ○ D: 4/9

17. How many signal can be made with 4 signs using any number of signs at a time?

○ A: 24 ○ B: 60

○ C: 64 ○ D: 82

18. How many words can be formed by taking four different letters of the word MATHEMATICS?

○ A: 7920 ○ B: 1680

○ C: 1260 ○ D: 68

19. $^{n}P_{r}$ = ?

○ A: $^{n}C_{r} * r!$ ○ B: $^{n}C_{n-r} * r!$

○ C: $^{n}C_{n-r}$ ○ D: Both A and B.

20. If the probability that a batsmen scores a century in any given match is 0.3. On average how many matches the batsmen would play to score his first century?

○ A: 2 ○ B: 4

○ C: 15 ○ D: 30

TEST 3

1. **A matrix is chosen at random from the set of all 2 x 2 matrices with elements 0 and 1 only. The probability that the value of the determinant of the matrix chosen is positive is?**

○ A: 1/8 ○ B: 3/16

○ C: 1/16 ○ D: 13/16

2. **Six identical coins are arranged in a row. The number of ways, in which the number of tails is equal to the number of heads is?**

○ A: 20 ○ B: 24

○ C: 36 ○ D: 48

3. **3 books of english and 5 books of urdu are randomly placed on a shelve. What is the probability that books on the same subject are together?**

○ A: 1/56 ○ B: 1/7

○ C: 2/8! ○ D: 1/28

4. **When a dice is rolled probability that even number or number greater than 4 appear is?**

○ A: 5/6 ○ B: 1/6

○ C: 2/3 ○ D: 1/3

5. **There are 10 lamps of different colors in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is?**

○ A: 1025 ○ B: 1024

○ C: 1023 ○ D: 10!

6. **Eight chairs are numbered 1 to 8. 2 women and 3 men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is?**

○ A: ${}^4C_3 \cdot {}^4C_2$ ○ B: ${}^4C_2 \cdot {}^4P_2$

○ C: ${}^4P_2 \cdot {}^4P_3$ ○ D: ${}^4P_2 \cdot {}^6P_3$

7. **Find the number of ways in which a mixed double tennis game can be arranged between 10 players consisting of 6 men and 4 women?**

○ A: 190 ○ B: 180

○ C: 90 ○ D: 48

8. **There are 18 children in the room including 9 boys and 9 girls. You call a child to give a sweet and the child goes back to the room and can potentially be chosen again. If total number of sweets are 4, what is the probability that atleast one boy gets the sweet?**

○ A: 1/16 ○ B: 15/16

○ C: 9/16 ○ D: 7/18

9. **If five digit numbers are formed from 1,2,3,4,8. What is the probability of forming a number with 2 and 8 not next to each other?**

○ A: 2/5 ○ B: 2/7

○ C: 5/7 ○ D: 3/5

10. **In how many ways 8 books including 2 English books can be arranged together such that English books are not together?**

○ A: 5040 ○ B: 10080

○ C: 30240 ○ D: 40320

A person wishes to make up as many different parties as he can out of his 20 friends, such that each party consists of the same number of persons. The number of friends he should invite at a time is?

○ A: 5
○ B: 8
○ C: 10
○ D: 12

11. Pakistan plays two matches each with West Indies and Australia. In any match, the probabilities of Pakistan getting points 0, 1 and 2 are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of Pakistan getting at least 7 points is?

○ A: 0.8750
○ B: 0.0875
○ C: 0.0625
○ D: 0.0250

12. In how many ways 5 boys and 4 girls can be seated in a bench such that boys and girls occupy alternate seats?

○ A: 1240
○ B: 1560
○ C: 2590
○ D: 2880

13. A man invites 4 men and 4 women to a party. In how many ways can they sit around a round table, so that no two men are together?

○ A: 6
○ B: 24
○ C: 132
○ D: 144

14. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:?

○ A: 3/22
○ B: 1/22
○ C: 2/91
○ D: 3/91

15. Two different numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is? Hint: $a^2 - b^2$ is divisible by 3 if both the numbers are divisible by 3 or none of them is divisible by 3.

○ A: 2/87
○ B: 19/87
○ C: 37/87
○ D: 47/87

16. $^{13}C_9 - {}^{12}C_8$ is equal to?

○ A: $^{13}C_7$
○ B: $^{13}C_9$
○ C: $^{12}C_9$
○ D: None of the above.

17. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 points lying on them respectively. The number of triangles that can be constructed using these points as vertices is?

○ A: 205
○ B: 208
○ C: 220
○ D: 260

18. If A and B are two events, such that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\overline{B}) = 1/2$, then the events A and B are?

○ A: Independent
○ B: Dependent
○ C: Disjoint
○ D: None of the above.

19. How many necklaces can be made from 6 beads of different colors?

○ A: 60
○ B: 120
○ C: 360
○ D: 720

TEST 4

1. **A carton contains 20 bulbs, out of which 5 are defective. If a sample of 3 bulbs is selected at random, find the probability that 2 of them are defective bulbs?**

○ A: 1/16 ○ B: 3/64

○ C: 9/64 ○ D: 2/64

2. **The number of ways in which 12 balls can be divided between two friends, one receiving 8 and the other 4 is?**

○ A: 12! / 8!4! ○ B: 12!2! / 8!4!

○ C: 12! / 8!4!2! ○ D: 8!4!

3. **The probability that A can solve a problem is 2/3 and the probability that B can solve the problem is 3/4. The probability that at least one of A and B will be able to solve the problem is?**

○ A: 11/12 ○ B: 5/12

○ C: 1/12 ○ D: 1/2

4. **Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 1 heads after six tosses?**

○ A: 0.08 ○ B: 0.17

○ C: 0.30 ○ D: 0.44

5. **How many 5 digit number divisible by 2 can be formed from 1,2,3,5,7?**

○ A: 24 ○ B: 48

○ C: 124 ○ D: 132

6. **Out of 40 consecutive integers, two are chosen at random. The probability that their sum is odd is?**

○ A: 1/200 ○ B: 1/2

○ C: 20/39 ○ D: 1/20

7. **Cards are drawn one by one at random from a well shuffled pack of 52 cards. What is the probability that there is only one ace in first 17 cards?**

○ A: $({}^{4}C_1 * {}^{48}C_{16}) / {}^{52}C_{17}$ ○ B: ${}^{48}C_{16} / {}^{52}C_{17}$

○ C: $({}^{4}C_1 + {}^{48}C_{16}) / {}^{52}C_{17}$ ○ D: ${}^{4}C_1 / {}^{52}C_{17}$

8. ***H.C.F of n !, (n + 1) ! and (n + 2) ! is?***

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: None of the above.

9. **The number of arrangements which can be made using all the letters of the word LAUGH, if the vowels are adjacent is?**

○ A: 120 ○ B: 24

○ C: 48 ○ D: 56

10. **On the occasion of Eid festival, each student of a class sends greeting cards to others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is?**

○ A: ${}^{20}C_2$ ○ B: $2 \times {}^{20}C_2$

○ C: $2\ {}^{20}P_2 - 1$ ○ D: None of the above.

11. **There are 4 letter boxes in a post office. In how many ways can a man post 8 different letters?**

○ A: 4^8 ○ B: 8^4

○ C: 8! ○ D: 4!

12. 5 men and 6 women have to be seated in a straight row, so that no two women are together. Find the number of ways in which this can be done?

○ A: 43200 ○ B: 39600
○ C: 36000 ○ D: 86400

13. The number of ways in which 5 beads of different colours can form a necklace is?

○ A: 6 ○ B: 12
○ C: 24 ○ D: 60

14. L.C.M. of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!
○ C: (n+2)! ○ D: n

15. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

○ A: ¾ ○ B: 1/3
○ C: 7/19 ○ D: 9/21

16. $^{n}P_{n}$ = ?

○ A: $^{n}C_{n}$ ○ B: $^{n+1}C_{n}$
○ C: n ○ D: n!

17. Everybody in a room shakes hand with every other person. The total number of hand shakes is 66. Find the total number of persons in the room?

○ A: 9 ○ B: 10
○ C: 11 ○ D: 12

18. A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 1/3, 1/4 respectively. What is the probability that the problem will be solved?

○ A: ¼ ○ B: 1/24
○ C: 7/24 ○ D: 3/4

19. The number of ways in which a mixed double game can be arranged from among nine married couples, if no husband and wife play in the same game is?

○ A: 1512 ○ B: 756
○ C: 3024 ○ D: 3298

20. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: C(p + q, q) ○ B: P(p + q, p)
○ C: P(p + q, q) ○ D: C(p + q, p - q)

21. If you toss four coins, what is the probability of getting two heads and two tails?

○ A: 3/16 ○ B: 1/8
○ C: 2/8 ○ D: 3/8

22. When three dice are thrown, what is the probability of getting the same number on three of them?

○ A: 1/216 ○ B: 1/36
○ C: 5/36 ○ D: 1/6

23. The number of digits that can be formed from 2, 3, 5, 7, 8 with 2 and 8 next to each other is?

○ A: 24
○ B: 36
○ C: 48
○ D: 72

24. An employer wants to hire 3 analysts from 6 applicants and 2 designers from 4 applicants. What is the total number of ways in which she can make the selection?

○ A: 1490
○ B: 132
○ C: 120
○ D: 60

25. If ${}^{n}C_{r-1} = 36$, ${}^{n}C_{r} = 84$ and ${}^{n}C_{r+1} = 126$, then r is equal to?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

26. Four cars are racing in a circuit. What are the total number of permutations with which they can cross the finish line?

○ A: 4
○ B: 16
○ C: 18
○ D: 24

27. The probability that the 1st day of a random chosen month is a Friday is?

○ A: 1/7
○ B: 1/12
○ C: 1/19
○ D: 1/84

28. m parallel lines in a plane are intersected by a family of n parallel lines. The total number of parallelograms so formed is?

○ A: (m-1)(n-1) / 4
○ B: mn/4
○ C: m(m-1)(n-1)/2
○ D: mn(m-1)(n-1)/4

29. There are 10 girls and 20 boys in a class. 5 girls and 10 boys have blue eyes. Find the probability that one student chosen at random is a girl and has blue eyes?

○ A: 2/3
○ B: 5/6
○ C: 1/6
○ D: 1/2

30. If $P(A \cup B) \neq P(A) + P(B)$ Then;

○ A: A and B are disjoint sets.
○ B: A and B are Independent sets
○ C: A and B are overlapping sets
○ D: A and B are unit event sets.

31. From a set of 17 cards numbered 1 to 17, one card is drawn at random. The probability that the number is divisible by 3 or 7 is?

○ A: 2/17
○ B: 5/17
○ C: 7/17
○ D: 9/17

32. The number of times the digit 3 will appear listing the integers from 1 to 1000 is?

○ A: 271
○ B: 280
○ C: 297
○ D: 300

33. Three unbiased coins are tossed. What is the probability of getting atleast one head?

○ A: ¾
○ B: 1/4
○ C: 1/8
○ D: 7/8

Induction & Binomial Theorem

TEST 1

1. **Which of the following is not true regarding the binomial expansion of $(a + x)^n$?**

   ○ A: Total number of terms is n + 1.

   ○ B: Sum of exponents of a and x in each term of expansion is equal to n.

   ○ C: Exponent of a decrease from n to n - 1.

   ○ D: Exponent of x increase from 0 to n.

2. **What is the coefficient of the third term for $(x + y)^5$?**

   ○ A: 2　　○ B: 5

   ○ C: 8　　○ D: 10

3. **What is the general term of $(x + 2/x)^4$?**

   ○ A: $C(4,k)\ 2^k\ x^{4-2k}$　　○ B: $C(4,k)\ 2^k\ x^{2-2k}$

   ○ C: $C(4,k)\ 2^k\ x^{4-k}$　　○ D: $C(4,k)\ 2^{2k}\ x^{2-2k}$

4. **$(x+y)^4 = ?$**

   ○ A: $x^4 + 2x^3y + 4x^2y^2 + 2xy^3 + y^4$　　○ B: $x^4 + 4x^3y + 6x^2y^2 + 2xy^3 + y^4$

   ○ C: $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$　　○ D: $x^4 + 4x^3y + 8x^2y^2 + 4xy^3 + y^4$

5. **If n is odd, the middle term in the expansion of $(a + x)^n$ is?**

   ○ A: n/2 + 1　　○ B: n/2 and n/2 + 1

   ○ C: (n + 1) / 2 and (n + 2) / 2　　○ D: (n + 1) / 2 and (n + 3) / 2

TEST 2

1. The method of mathematical induction was devised by?

○ A: David Hilbert ○ B: Francesco Mourolico

○ C: Issac Newton ○ D: Carl F. Gauss

2. What is the 3rd term in the binomial expansion of

3. $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^6$

○ A: -20 ○ B: 20

○ C: 15 a/x ○ D: 15 x/a

4. Third term in the expansion of $(1 - x)^{-1}$ is?

○ A: x^2 ○ B: $2x^2$

○ C: $-x^2$ ○ D: $-2x^2$

5. Which of the following would have even number of terms in its expansion?

○ A: $(a + x)^{20}$ ○ B: $(a + x)^{90}$

○ C: $(a + x)^{51}$ ○ D: Both A and B.

6. What is the value of $(0.97)^6$ using only the first three terms of binomial expansion?

○ A: 0.8246 ○ B: 0.8318

○ C: 0.8335 ○ D: 0.8452

7. How many terms are there in the expansion of $(a + x)^{100}$

○ A: 99 ○ B: 100

○ C: 101 ○ D: Cannot determine.

8. What is the middle term in the expansion of $(4x – y)^8$?

○ A: $19240\ x^4y^4$ ○ B: $17920\ x^4y^4$

○ C: $56220\ x^2y^2$ ○ D: $18420\ x^4y^4$

9. What is the contant term in the expansion of $(1/z^3 + z^2)^5$?

○ A: 10 ○ B: 16

○ C: 18 ○ D: 24

10. What is the fourth term in the expansion of $(1 - x)^{1/2}$?

○ A: - ¼ ○ B: - 1/2 x

○ C: $-1/8\ x^2$ ○ D: $- 1/16\ x^3$

TEST 3

1. For which x the 5th expansion member equals $M_5 = 105$?

$$\left(\frac{1}{2\sqrt{x}} - \frac{1}{2}\right)^{10}$$

○ A: ½
○ B: 1/4
○ C: 1/8
○ D: 2

2. **If x is the sum of the odd coefficients and y is the sum of the even coefficients in a binomial expansion. Then?**

○ A: $x = y/2$
○ B: $x = y$
○ C: $x = 2y$
○ D: None of the above.

3. **The rule of binomial expansion for $(a + x)^n$ is valid if?**

○ A: a and x both are real numbers.
○ B: a is real and x can be real or complex.
○ C: x is real and a can be real or complex.
○ D: Both a and x can be real or complex.

4. **Find out the member of the binomial expansion of $(x + x^{-1})^8$ not containing x?**

○ A: 7th
○ B: 6th
○ C: 5th
○ D: 4th

5. **If in the expansion of $(x + y^3)^n$ the coefficient of the 3rd term is greater by 44 than the 2nd term. The value of n is?**

○ A: 8
○ B: 9
○ C: 10
○ D: 11

6. **Which term in the expansion of $(x - 2/x^2)^{13}$ has term x^{-2} ?**

○ A: 5th
○ B: 6th
○ C: 7th
○ D: 8th

7. **The sum of coefficients in the binomial expansion is equal to?**

○ A: 2^n
○ B: 2^{2n}
○ C: 2^{2n-1}
○ D: 2^{n-1}

8. **What is the middle term in the expansion of $(x + 1/x)^{2n}$? Where $x \neq 0$.**

○ A: C(2n,n)
○ B: C(2n,n) x
○ C: C(2n,n) x^{2n}
○ D: C(2n,n) x^{3n}

9. **What is the constant term in the expansion of $(x^2 - 2/x^2)^8$?**

○ A: 1080
○ B: 1120
○ C: 2400
○ D: 2480

10. **Which member of the binomial expansion of $(2x^3 + x^{-1})^{10}$contains x^6?**

○ A: 6th
○ B: 7th
○ C: 8th
○ D: 9th

11. **What is the term containing x^{14} in the expansion of $(x^3 - 1/x^2)^{13}$?**

○ A: C(13,7) $12x^{14}$
○ B: -C(13,6) $10x^{14}$
○ C: -C(13,5) x^{14}
○ D: C(13,8) $4x^{14}$

Trigonometry

TEST 1

1. 235° expressed in radians is?

○ A: $\pi / 235$ ○ B: $85\pi / 49$

○ C: $47\pi / 36$ ○ D: $235/\pi$

2. 1/2 rotation anti-clockwise is called?

○ A: Right angle ○ B: Straight Angle

○ C: Circle ○ D: None of the above.

3. If $5\sin\theta = 3$, $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to

○ A: ½ ○ B: 1

○ C: 2 ○ D: 4

4. If $\cos 3\theta = \sqrt{3}/2$; $0 < \theta < 20^o$ then the value of θ is?

○ A: 0° ○ B: 5°

○ C: 10° ○ D: 15°

5. If $\sec\theta - \tan\theta = 1/2$ then $\sec\theta + \tan\theta = ?$

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. cos A - cos B = ?

○ A: 2 cos (A+B)/2 cos (A-B)/2 ○ B: 2 cos (A+B)/2 sin (A-B)/2

○ C: 2 sin (A+B)/2 cos (A-B)/2 ○ D: -2 sin (A+B)/2 sin (A-B)/2

7. Which of the following is not ture?

○ A: $\cot(-\theta) = -\cot\theta$ ○ B: $\cos(-\theta) = \cos\theta$

○ C: $\sin(-\theta) = -\sin\theta$ ○ D: $\tan(-\theta) = \tan(\theta)$

8. $\sin 30^0 + \cos 60^0 + \tan 45^0$ is equal to?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

9. In sexagesimal system angle is represented in?

○ A: Degrees ○ B: Degrees, Minutes and Seconds

○ C: Radians ○ D: Mircro radians.

10. If $\sin\theta = \cos\theta$ then $\theta = ?$

○ A: 30° ○ B: 45°

○ C: 60° ○ D: 75°

11. If the length of arc is twice the radius of the circle. Then angle subtended at the center is?

○ A: 1 radian ○ B: 2 radian

○ C: $\pi/3$ radian ○ D: $\pi/4$ radian

12. What is the period of tan 4x?

○ A: π ○ B: π/3
○ C: π/4 ○ D: π/8

13. $\tan^2 x - \sin^2 x$ is equal to?

○ A: $\tan^2 x \operatorname{cosec}^2 x$ ○ B: $\sin^2 x \cot^2 x$
○ C: $\sec^2 x \operatorname{cosec}^2 x$ ○ D: $\tan^2 x \sin^2 x$

14. $\tan 225^o$ =?

○ A: 0 ○ B: 1
○ C: √3 ○ D: 1/√3

15. tan (2π - θ) = ?

○ A: tan θ ○ B: - tan θ
○ C: cot θ ○ D: - cot θ

16. If cos A = 1/√2 and sin B = 1/2 then A+B = ?

○ A: 60° ○ B: 75°
○ C: 90° ○ D: 120°

17. 1° = ?

○ A: 0.0125 radian ○ B: 0.0175 radian
○ C: 0.0225 radian ○ D: 0.0275 radian

18. 35° 20' in radians is?

○ A: 28π / 220 ○ B: 53π / 45
○ C: 53π / 290 ○ D: 53π / 270

19. cos (π + θ) = ?

○ A: sin θ ○ B: - sin θ
○ C: cos θ ○ D: - cos θ

20. If A = B = 60°. Then $\frac{cscA + cotB}{secA * tanB}$ = ?

○ A: 0 ○ B: 1
○ C: ½ ○ D: 1/√2

TEST 2

1. Which of the following relations is possible?

○ A: sec θ = 2/3 ○ B: sin θ = 4/3
○ C: tan θ = 2014 ○ D: $\cos\theta = (1+t^2) / (1-t^2)$

2. $\sec(-960^o)$ = ?

○ A: 2 ○ B: √2
○ C: -√2 ○ D: -2

3. cos 2α = ?

○ A: sin α cos α ○ B: 2 sin α cos α
○ C: $\cos^2\alpha - \sin^2\alpha$ ○ D: $\cos^2\alpha + \sin^2\alpha$

4. If α, β and γ are the angles of a triangle then $\sin(\alpha + \beta) = ?$

○ A: $\sin\gamma$
○ B: $\cos\gamma$
○ C: $-\sin\gamma$
○ D: $-\cos\gamma$

5. $\sin(-625^\circ) = ?$

○ A: $\sin 5^\circ$
○ B: $\cos 5^\circ$
○ C: $\sin 15^\circ$
○ D: $\cos 15^\circ$

6. Converting 21.256° to DMS gives?

○ A: $21^\circ\ 15.36'$
○ B: $21^\circ\ 18'\ 32''$
○ C: $21^\circ\ 15'\ 22''$
○ D: $21^\circ\ 15'\ 28''$

7. If $\sin(A + B + C) = 1$, $\tan(A - B) = 1/\sqrt{3}$, and $\sec(A + C) = 2$, then?

○ A: $A = 120^\circ$, $B = 60^\circ$ and $C = 0^\circ$
○ B: $A = 60^\circ$, $B = 30^\circ$ and $C = 0^\circ$
○ C: $A = 60^\circ$, $B = 60^\circ$ and $C = 60^\circ$
○ D: $A = 90^\circ$, $B = 60^\circ$ and $C = 30^\circ$

8. $\sin A + \sin B = ?$

○ A: $-2\sin(A+B)/2\ \sin(A-B)/2$
○ B: $2\cos(A+B)/2\ \cos(A-B)/2$
○ C: $2\sin(A+B)/2\ \cos(A-B)/2$
○ D: $2\cos(A+B)/2\ \sin(A-B)/2$

9. The value of $\tan 15^\circ + \cot 15^\circ$ is ?

○ A: 1
○ B: $\sqrt{3}$
○ C: $\sqrt{3}/2$
○ D: 4

10. The period of the function $f(x) = \cos 4x$ is?

○ A: π
○ B: 2π
○ C: $\pi/2$
○ D: $3\pi/2$

11. If $x = \sin^2\theta\cos\theta$ and $y = \cos^2\theta\sin\theta$ then $\sin\theta = ?$

○ A: x^2 / y
○ B: y^2 / x
○ C: $(y^2 / x)^{1/3}$
○ D: $(x^2 / y)^{1/3}$

12. What is the period of $\cot x/7$?

○ A: 7π
○ B: $2\pi/7$
○ C: $\pi/7$
○ D: $\pi/14$

13. If $\cot\theta = \sin 2\theta$, then θ is equal to?

○ A: 45° and 90°
○ B: 45° and 90°
○ C: 90° and 60°
○ D: 60° and 30°

14. The value of $\cos^2 15^\circ - \cos^2 30^\circ + \cos^2 45^\circ - \cos^2 60^\circ + \cos^2 75^\circ$ is?

○ A: 1
○ B: 1/2
○ C: 3/2
○ D: 2

15. If $\tan\theta = 8/15$ then what is the value of $\sec\theta$ for θ lying in the quadrant III?

○ A: 15/17
○ B: -15/17
○ C: 17/15
○ D: - 17/15

16. The largest value of $\sin\theta \times \cos\theta$ is?

○ A: 1
○ B: 1/2
○ C: $1/\sqrt{2}$
○ D: $1/\sqrt{3}$

17. (1 + sec θ) (1 - cos θ) = ?

○ A: sin θ
○ B: cot θ
○ C: cot θ cos θ
○ D: tan θ sin θ

18. sec (-7π/4) = ?

○ A: √2
○ B: -√2
○ C: 2/√3
○ D: - 2/√3

19. If the length of a chord of a circle is equal to the radius of that circle, the angle subtended (in radians) at the centre of the circle by the chord is?

○ A: 1
○ B: π/2
○ C: π/3
○ D: π/6

20. The value of cos1° * cos2° * cos3° ...... cos179° is ?

○ A: 0
○ B: 1
○ C: 2
○ D: -1

TEST 3

1. The perimeter of a certain sector of a circle is equal to half that of the circle of which it is a part. The circular measure of the angle of the sector is?

○ A: π
○ B: π - 2
○ C: 2π/3
○ D: π - 4

2. tan 3x - tan 2x - tan x is equal to?

○ A: tan x / (tan 2x * tan 3x)
○ B: $(\tan x)^3$
○ C: (tan 3x + tan 2x + tan x) - (tan x * tan 2x)
○ D: tan x * tan 2x * tan 3x

3. sin 75° = ?

○ A: $\frac{\sqrt{2}(\sqrt{3}+1)}{4}$
○ B: $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$
○ C: √3/4
○ D: -√3/4

4. The equation sin x cos x = 2 has?

○ A: One solution
○ B: Two solutions
○ C: Infinite solutions.
○ D: No solution.

5. cos (x+y) sin (x-y) = ?

○ A: 1/2 (sin 2x - sin 2y)
○ B: 1/2 (sin 2y - sin 2x)
○ C: sin 2x - sin 2y
○ D: sin 2x + sin 2y

6. tan (294°) = ?

○ A: cot 32°
○ B: - cot 32°
○ C: - cot 24°
○ D: cot 24°

7. If sin A + sin B = x and cos A + cos B = y, cos(A - B) is equal to ?

○ A: $x^2 + y^2 - 2$
○ B: $(x^2 + y^2 - 2) / 2$
○ C: $(2 - x^2 + y^2) / 2$
○ D: $(2 - x^2 - y^2) / 2$

8. Period of cot (3x) - sin (4x) is?

○ A: πq
○ B: π/2
○ C: π/3
○ D: π/4

9. $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = ?$

○ A: 1
○ B: 2
○ C: tan 2θ
○ D: cot 2θ

10. (1 - cos α) / sin α = ?

○ A: cos α/2
○ B: sin α/2
○ C: sec α/2
○ D: tan α/2

11. 8 sin x/8 cos x/2 cos x/4 cos x/8 = ?

○ A: 4 sin x
○ B: sin x
○ C: cos x
○ D: 8 cos x

12. What is the domain of $\sqrt{\sin^{-1}2x + \pi/6}$ **?**

○ A: [1/4 , 1/2]
○ B: [-1/4 , 1/2]
○ C: [1/8 , 1/2]
○ D: [-1/8 , 1/2]

13. cos 12° + cos 48° = ?

○ A: 2 cos 30° cos 18°
○ B: - 2 cos 30° cos 18°
○ C: 2 cos 30° sin 18°
○ D: - 2 cos 30° sin 18°

14. If $(x \sin^3 \alpha + y \cos^3 \alpha) = \sin \alpha \cos \alpha$ **and**
$(x \sin \alpha - y \cos \alpha = 0)$**, then** $x^2 + y^2 = ?$

○ A: 0
○ B: 2
○ C: -1
○ D: 1

15. If $\sin^2\theta + 3 \cos\theta - 2 = 0$**,** $\cos^3\theta + \sec^3\theta$ **is equal to?**

○ A: 18
○ B: 9
○ C: 6
○ D: 3

16. The value of tan 1° * tan 2° * tan 3° ...... tan 89° = ?

○ A: 0
○ B: 1
○ C: -1
○ D: 1/2

17. If cos (A - B) = 3/5 and tan A . tan B = 2 then ?

○ A: cos A cos B = 1/5
○ B: sin A sin B = -2/5
○ C: cos (A + B) = 1/5
○ D: sin A sin B =4/5

18. sin 2α / (1 + cos 2α) = ?

○ A: cot α
○ B: tan α
○ C: sec α
○ D: csc α

19. Find the value of $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$

○ A: tan 3θ
○ B: cot 3θ
○ C: tan 6θ
○ D: cot 6θ

20. $\dfrac{\tan\alpha + \tan\beta}{\tan\alpha - \tan\beta} = ?$

○ A: sin (α + β) / sin (α - β)
○ B: sin (α - β) / sin (α + β)
○ C: cot (α + β)
○ D: sin α / sin (α - β)

TEST 4

1. tan (15°) = ?

○ A: (√3 + 1) / (√3 - 1)
○ B: (√3 - 1) / (√3 + 1)
○ C: √3 / (√3 + 1)
○ D: 1/3√3

2. The bottom of a pendulum describes an arc 3 ft long when the pendulum swings through an angle of 1/5 radian. The length of the pendulum in feet is ?

○ A: 15 ft
○ B: 12 ft
○ C: 5/3 ft
○ D: 3/5 ft

3. tan (π/4 + θ) tan (3π/4 + θ) is equal to ?

○ A: 0
○ B: 1
○ C: -1
○ D: 2

4. If tan 2 A = cot (A - 18°), then the value of A is?

○ A: 18°
○ B: 24°
○ C: 27°
○ D: 36°

5. What is the period of sec 9x ?

○ A: π
○ B: 2π/9
○ C: π/9
○ D: π/18

6. If cot θ > 0 and sin θ < 0 then θ lies in the ?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

7. If α, β and γ are the angles of a triangle then tan (α + β) - tan γ = ?

○ A: 2 tan γ
○ B: - 2 tan γ
○ C: 0
○ D: 1

8. 1 radian = ?

○ A: 60°
○ B: 59°
○ C: 58°
○ D: 57°

9. 6'' in radians = ?

○ A: π / 216000 radians
○ B: π / 108000 radians
○ C: π / 648000 radians
○ D: π / 3600 radians

10. The radius of a circle is 8 in. Find the angle in radians that an arc of 1 ft subtends in the center of this circle?

○ A: 1/8
○ B: 2/8
○ C: 3/2
○ D: π/6

11. In a triangle ABC, A = 45°, then the value of (1 + cot B) (1 + cot C) is equal to ?

○ A: 0
○ B: 1
○ C: -1
○ D: 2

12. If $\tan \theta = -4/3$, $\sin \theta$ = ?

○ A: -4/5 but not 4/5
○ B: 4/5 but not -4/5
○ C: 4/5 or - 4/5
○ D: Undefined.

13. Which of the following is true for $0^o \leq \theta < 90^o$?

○ A: $1/\sec \theta > 1$
○ B: $1/\text{cosec}\, \theta < 1$
○ C: $\sec \theta = 0$
○ D: $1/\cos \theta < 1$

14. Which of the following is true about θ in the quadrant II?

csc θ is positive, cos θ is positive, tan θ is positive

○ A: i only
○ B: i and ii only
○ C: ii and iii only
○ D: None of them is true

15. Domain of csc θ is θ Є R except θ = ?

○ A: nπ where n Є Z
○ B: [(2n+1)/2] π where n Є Z
○ C: nπ/2 where n Є Z
○ D: (2n+1/2)π where n Є Z

16. If $\sec \theta + \tan \theta = x$ then $\tan \theta$ = ?

○ A: $(x^2 - 1) / x$
○ B: $(x^2 + 1) / x$
○ C: $(x^2 + 1) / 2x$
○ D: $(x^2 - 1) / 2x$

17. Which of the following is not possible?

○ A: $\sin \theta = ¾$
○ B: $\tan \theta = 75$
○ C: $\text{cosec}\, \theta = 5/3$
○ D: $\cos \theta = (1 + t^2) / (1 - t^2)$

18. The value of $\sin^2 \pi/8 + \sin^2 3\pi/8 + \sin^2 5\pi/8 + \sin^2 7\pi/8$ is?

○ A: -1
○ B: 0
○ C: 1
○ D: 2

19. If tan A = 1/2, then tan 2A is equal to?

○ A: 1
○ B: 1/2
○ C: 4/3
○ D: 5/4

20. If A = B = C = 60° then $\dfrac{tanA + tanB + tanC}{tanA * tanB * tanC}$ = ?

○ A: 0
○ B: 1
○ C: -1
○ D: √3

Inverse Trigonometric Function

TEST 1

1. **Which of the following is true?**

   $\sin^{-1} x = (\sin x)^{-1,}$ $\cos^{-1} x = (\cos x)^{-1,}$ $\tan^{-1} x = (\cot x)^{-1}$

   ○ A: i and ii only ○ B: ii only

   ○ C: i, ii and iii ○ D: None of them is true.

2. **$\cos^{-1} A + \cos^{-1} B$ = ?**

   ○ A: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

   ○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$

   ○ C: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$

   ○ D: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$

3. **Principal value of $\sin^{-1} (- \sqrt{3}/2)$ = ?**

   ○ A: $-2\pi/3$ ○ B: $-\pi/3$

   ○ C: $\pi/3$ ○ D: $2\pi/3$

4. **Range of $y = \sin^{-1} x$ is?**

   ○ A: $- \pi/2 \le y \le \pi/2$ ○ B: $- \pi \le y \le \pi$

   ○ C: $- \pi/4 \le y \le \pi/4$ ○ D: $-1 \le y \le 1$

   The value of $\tan^{-1} (- 1/\sqrt{3})$ is?

   ○ A: $\pi/3$ ○ B: $- \pi/4$

   ○ C: $3\pi/4$ ○ D: $- \pi/6$

5. **What is the value of $\tan^{-1} 3/4 + \tan^{-1} 5/12$?**

   ○ A: $\tan^{-1} 56/33$ ○ B: $\tan^{-1} 16/33$

   ○ C: $\tan^{-1} 15/48$ ○ D: $\tan^{-1} 16/63$

6. **y = tan x is called principal tangent function if ?**

   ○ A: - infinity < x < infinity ○ B: $- \pi < x < \pi$

   ○ C: $- \pi/2 < x < \pi/2$ ○ D: $0 < x < \pi$

7. **$\cos^{-1} (-1/2)$ = ?**

   ○ A: $\pi/3$ ○ B: $-2\pi/3$

   ○ C: $2\pi/3$ ○ D: Both B and C.

8. **Range of $y = \cos^{-1} x$ is?**

   ○ A: $- \pi/2 \le y \le \pi/2$ ○ B: $- \pi \le y \le \pi$

   ○ C: $0 \le y \le \pi/2$ ○ D: $0 \le y \le \pi$

9. **$2 \tan^{-1} A$ = ?**

   ○ A: $\tan^{-1} 2A / (1 + A^2)$ ○ B: $\tan^{-1} 2A / (1 - A^2)$

   ○ C: $\tan^{-1} A / (1 + A^2)$ ○ D: $\tan^{-1} A / (1 - A^2)$

10. **$\cos (\cos^{-1} 1/5)$ = ?**

    ○ A: 1 ○ B: 5

    ○ C: 1/5 ○ D: 4/5

11. $\cos (\sin^{-1} 1/\sqrt{2}) = ?$

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}/3$
○ C: $2/\sqrt{3}$
○ D: $1/2$

12. $\cos^{-1} A - \cos^{-1} B = ?$

○ A: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$
○ D: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

13. Which of the following function has domain ranging from - infinity to + infinity ?

○ A: $y = \sin^{-1} x$
○ B: $y = \sec^{-1} x$
○ C: $y = \cos^{-1} x$
○ D: $y = \tan^{-1} x$

TEST 2

1. The value of sec $\left[\tan^{-1}\left(\frac{b+a}{b-a}\right) - \tan^{-1}\left(\frac{a}{b}\right)\right]$ is

○ A: $\sqrt{3}/2$
○ B: $\sqrt{2}$
○ C: 1
○ D: $1/\sqrt{3}$

2. If $y = \sin^{-1} x$ then $\cos (\sin^{-1} x) = ?$

○ A: $(1-x)^{1/2}$
○ B: $(1-x)^{1/2}$
○ C: $(1-x^2)^{1/2}$
○ D: $(1+x^2)^{1/2}$

3. $\cos [\tan^{-1} 1/3 + \tan^{-1} 1/2] = ?$

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}$
○ C: $\sqrt{3}/2$
○ D: $1/2$

4. $\cot^{-1} (-1) = ?$

○ A: 1
○ B: $\pi/2$
○ C: $2\pi/3$
○ D: $3\pi/4$

5. Principal value of $\sin^{-1} (\sin 3\pi/5) = ?$

○ A: $3\pi/5$
○ B: $4\pi/5$
○ C: $2\pi/5$
○ D: $\pi/5$

6. What is the principal value of $\cot^{-1} (-1/\sqrt{3})$?

○ A: $3\pi/2$
○ B: $\pi/3$
○ C: $\pi/6$
○ D: $2\pi/3$

7. $\sin^{-1} 3/5 + \sin^{-1} 8/17 = ?$

○ A: $\sin^{-1} (11 / 23)$
○ B: $\sin^{-1} (19 / 76)$
○ C: $\sin^{-1} (63 / 95)$
○ D: $\sin^{-1} (77 / 85)$

8. Which of the following is Domain and Range of $y = \cot^{-1} x$?

○ A: Domain: $-\infty < x < \infty$ Range: $-\pi/2 < y < \pi/2$
○ B: Domain: $-1 < x < 1$ Range: $-\pi/2 < y < \pi/2$
○ C: Domain: $-\infty < x < \infty$ Range: $-\pi < y < \pi$
○ D: Domain: $-\infty < x < \infty$ Range: $0 < y < \pi$

9. Principal value of $\sin^{-1}$ [sin (2π/3)] = ?

○ A: 2π/3
○ B: -2π/3
○ C: π/3
○ D: π/6

10. cos ($\sin^{-1}$ 3/5) = ?

○ A: 3/5
○ B: 1/3
○ C: 4/5
○ D: 2/√3

11. Range of y = $\tan^{-1}$ x is ?

○ A: $-\pi/2 < y < \pi/2$
○ B: $-\pi/2 \le y \le \pi/2$
○ C: $0 \le y \le 2\pi$
○ D: $0 < y < 2\pi$

12. $tan^{-1}\dfrac{a-b}{1+ab}+tan^{-1}\dfrac{b-c}{1+bc}=?$

○ A: $\tan^{-1}$ a - $\tan^{-1}$ c
○ B: $\tan^{-1}$ a - $\tan^{-1}$ b
○ C: $\tan^{-1}$ b - $\tan^{-1}$ c
○ D: $\tan^{-1}$ c - $\tan^{-1}$ a

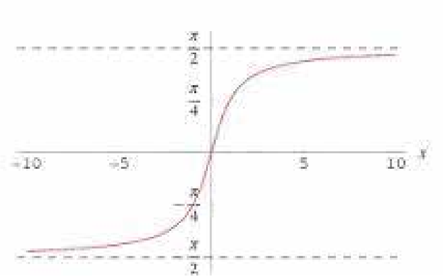
13. If α = 2$\cos^{-1}$ 4/5 then sin α = ?

○ A: 3/5
○ B: 24/25
○ C: 4/5
○ D: 30/25

14. $sin^{-1}(2x\sqrt{1-x^2})=?$

○ A: $\sin^{-1}$ x
○ B: 2 $\sin^{-1}$ x
○ C: 3 $\sin^{-1}$ x
○ D: 4 $\sin^{-1}$ x

15. The graph below is for which function?



○ A: y = $\sin^{-1}$ x
○ B: y = $\cos^{-1}$ x
○ C: y = $\tan^{-1}$ x
○ D: y = $\cot^{-1}$ x

16. If $\tan^{-1}$ (1 + x) + $\tan^{1}$ (1 − x) = π/2 then x = ?

○ A: 0
○ B: 1
○ C: -1
○ D: √3

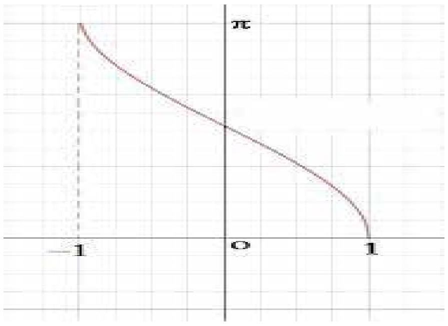
17. y = sec x is called a principal secant function if?

○ A: $-\pi \le x \le \pi$ and $x \ne \pi/2$ or $-\pi/2$
○ B: $-\pi/2 < x < \pi/2$
○ C: $0 \le x \le \pi$ and $x \ne \pi/2$
○ D: $0 \le x < \pi/2$

18. If α = $\sin^{-1}$ 5/13 , then cos α = ?

○ A: 8/13
○ B: 7/13
○ C: 11/13
○ D: 12/13

19. The graph below is for which function?



○ A: $\sin^{-1} x$

○ B: $\cos^{-1} x$

○ C: $\tan^{-1} x$

○ D: $\cot^{-1} x$

20. $\text{cosec}^{-1} (-2/\sqrt{3})$ = ?

○ A: $\pi/3$

○ B: $-\pi/3$

○ C: $4\pi/3$

○ D: $-4\pi/3$

TEST 3

1. $\sin (\sin^{-1} 1/5 + \cos^{-1} x) = 1$ then x = ?

○ A: 2/5

○ B: 1/3

○ C: 1/5

○ D: 1/2

2. $\sin (2\cos^{-1} x)$ = ?

○ A: $2x\sqrt{1-x^2}$

○ B: $2x\sqrt{1-x}$

○ C: $\dfrac{2x}{\sqrt{1-x^2}}$

○ D: $\dfrac{2x}{\sqrt{1+x^2}}$

3. Domain and range of $y = \csc^{-1} x$ is ?

○ A: Domain : $-\infty < x < \infty$ Range : $-\pi/2 \le y \le \pi/2$

○ B: Domain : $-1 \le x \le 1$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ C: Domain : $1 \le |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ D: Domain : $1 > |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

4. $\sin (\cos^{-1} -2/3)$ = ?

○ A: $1/\sqrt{2}$

○ B: $\sqrt{5}/3$

○ C: $1/\sqrt{3}$

○ D: $\sqrt{3}$

5. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, what is the value of x?

○ A: 1/6

○ B: -1

○ C: -1 and 1/6

○ D: 1

6. $\cos^{-1} (\cos 7\pi/6)$ = ?

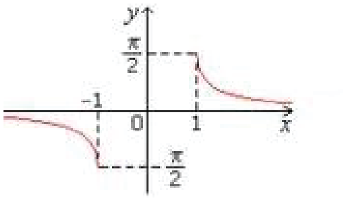
○ A: $7\pi/6$

○ B: $\pi/6$

○ C: $5\pi/6$

○ D: $\pi/3$

7. The graph below is for which function?



○ A: $y = \tan^{-1} x$
○ B: $y = \cot^{-1} x$
○ C: $y = \sec^{-1} x$
○ D: $y = \csc^{-1} x$

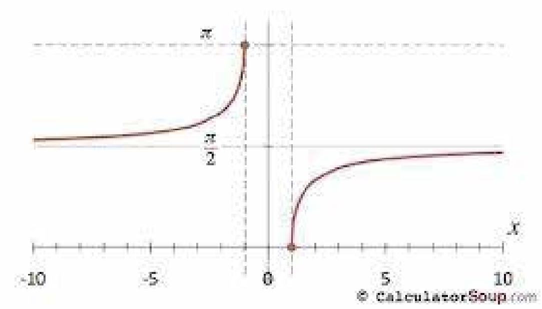
8. If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$, then $\cos^{-1} x + \cos^{-1} y$ is equal to ?

○ A: $2\pi/3$
○ B: $3\pi/2$
○ C: $\pi/5$
○ D: $\pi/3$

9. $\tan^{-1}(-x) = ?$

○ A: $\tan^{-1}(x)$
○ B: $-\tan^{-1}(x)$
○ C: $-\cot^{-1}(x)$
○ D: $\cot^{-1}(x)$

10. The graph below is for which function?



○ A: $y = \tan^{-1} x$
○ B: $y = \cot^{-1} x$
○ C: $y = \csc^{-1} x$
○ D: $y = \sec^{-1} x$

11. $\tan(\sin^{-1} x) = ?$

○ A: $x / (1-x^2)$
○ B: $x / (1-x)$
○ C: $\frac{x}{\sqrt{1+x^2}}$
○ D: $\frac{x}{\sqrt{1-x^2}}$

12. $\sin\left[\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right] =$

○ A: $\sqrt{3}/2$
○ B: $-\sqrt{3}/2$
○ C: ½
○ D: $-1/2$

13. The value of $\tan(\cos^{-1}(4/5) + \tan^{-1}(2/3))$ is equal to ?

○ A: 7/5
○ B: 17/6
○ C: 17/18
○ D: Cannot be determined.

14. The value of $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3$ is ?

○ A: $\pi/2$
○ B: -1
○ C: 1
○ D: 0

15. tan ($\sin^{-1}$ -3/4) = ?

○ A: $3/\sqrt{5}$

○ B: $-3/\sqrt{5}$

○ C: $3/\sqrt{7}$

○ D: $-3/\sqrt{7}$

16. Value of cos ($\tan^{-1}$ 15/8 - $\sin^{-1}$ 7/25) = ?

○ A: 114/350

○ B: 297/425

○ C: 215/345

○ D: 138/147

17. The product of the roots of the equation $\tan^{-1}(2x) + \tan^{-1}(3x) = 3\pi/4$ is ?

○ A: -1/6

○ B: -1/2

○ C: 1

○ D: 3

Function And Limits

TEST 1

1. If f(x,y,z)=2x+3y-z and f(a,b,0)=f(0,a,b), then b / a equals

○ A: 0

○ B: 2

○ C: ½

○ D: 1/4

2. Range of the function $f(x) = \sqrt{36 - x^2}$ is

○ A: $[0, -\infty]$

○ B: $[\infty, -\infty]$

○ C: $[0, 6]$

○ D: $[36, 1]$

3. If $f(x) = 3x^2 - 2x + 4$, f(-2) =

○ A: -2

○ B: 20

○ C: 4

○ D: 12

4. If $g(x) = x^3 - x^2 - x - 1$, then the value of g(-1) is:

○ A: 0

○ B: 1

○ C: -2

○ D: 2

5. Let $f(x) = 3x^2 + 4$, g(x) = 2 and h={(1,2),(2,1),(3,2)}.

○ A: f(x) is the only function.

○ B: f(x) and g(x) are the only functions.

○ C: f(x), g(x) and h(x) are all functions.

○ D: None of these are functions.

6. If f(x)=3 and g(x)=2, then f(g(x))=

○ A: 2

○ B: 3

○ C: 6

○ D: 5

7. Range of the function $f(x) = 2x - 3$ is

○ A: $(-\infty, +\infty)$

○ B: [2,3]

○ C: [2,10]

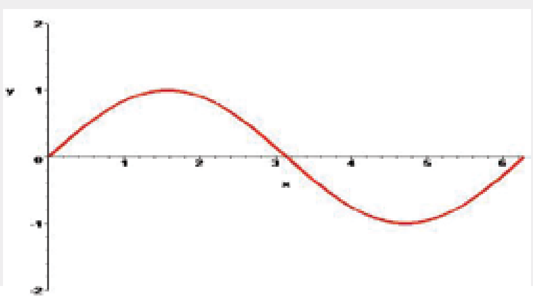
○ D: None of the above.

8. If f(x)=2x+3 and g(x) = x^2 - 1, then f(g(2))=

○ A: 4 ○ B: 9

○ C: 13 ○ D: 19

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If p(x)=4x-6 and p(a)=0, then a=

○ A: 3 ○ B: 2

○ C: 3/2 ○ D: 2/3

11. If f(x)=x and g(x)=x.f(x), then f(x) / g(x) =

○ A: x ○ B: 1/x

○ C: 1 ○ D: None of the above.

12. If $f(x) = x^7 - 97x^6 - 199x^5 + 99x^4 + 2x + 195, f(-1)$ equals:

○ A: 24 ○ B: 154

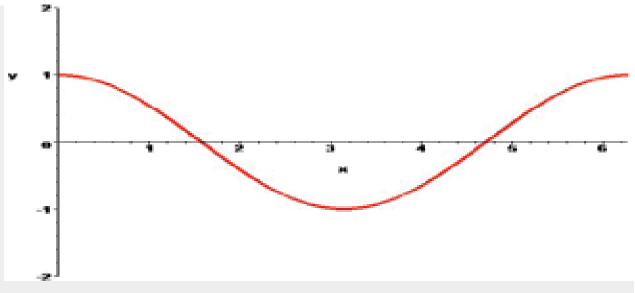
○ C: 272 ○ D: 393

13. What value(s) must be excluded for the domain of f={(x,y):y=$\frac{x+2}{x-2}$}?

○ A: 2 ○ B: -2

○ C: 0 ○ D: 2 and -2

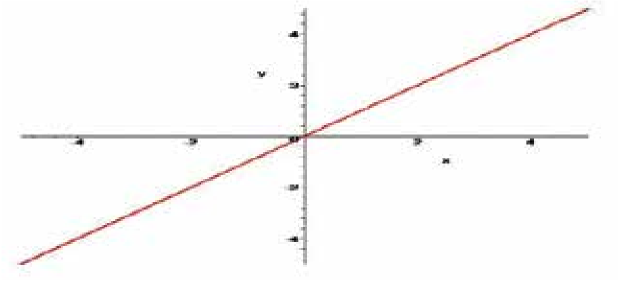
14. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the Above

16. If f(1) = 1 and f(2) = 2 and f(-1) = -1, then f(x) would be:

○ A: 0 ○ B: 1

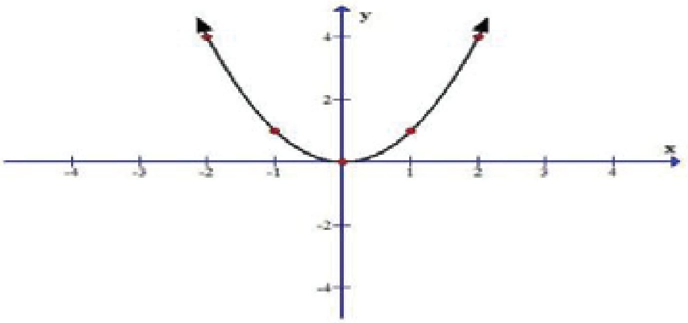
○ C: 2 ○ D: x

17. If $f(r,\theta) = r\cos\theta$, $f(2, \frac{\pi}{3}) =$

○ A: 2π ○ B: 1

○ C: $\frac{\pi}{6}$ ○ D: $\frac{1}{2}$

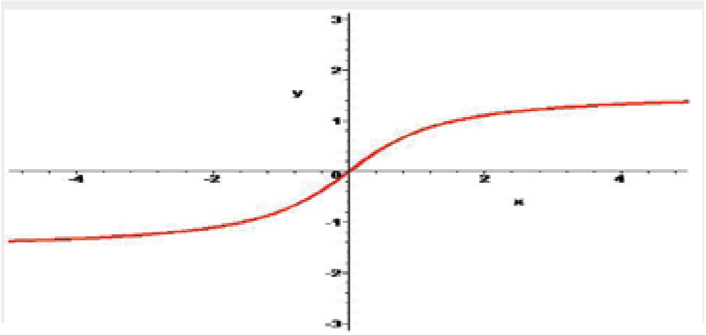
18. Which of the following functions represents the plot shown?



○ A: $f(x) = x^2$ ○ B: $f(x) = x^2 - x - 5$

○ C: $f(x) = x^3$ ○ D: None of the above.

19. The following figure shows a graph of which type of function?



○ A: Cosecant ○ B: Secant

○ C: Cotangent ○ D: Arctangent

20. If f(x, y, z) = $x^2 + y^2 - 2z$ for all real numbers x, y and z, then f(-1,-1,-1)=

○ A: 0 ○ B: 2

○ C: 4 ○ D: 6

TEST 2

1. If f(x,y)=3x+2y-8 and g(z) = z^2 for all real numbers x,y,z then f(3,g(4))=

○ A: 15 ○ B: 33

○ C: 45 ○ D: 25

2. For a function to be even as well as odd, it must be:

○ A: Symmetric about origin (by 180^0) ○ B: Symmetric about y-axis (by 180^0)

○ C: Both A and B ○ D: None of the above

3. If g(x)=3 and $f(x) = \dfrac{1}{3x+2}$, then f(g(3))=

○ A: 1/11 ○ B: 1/17

○ C: 3/5 ○ D: 9/11

4. Which statement is correct for the following functions?

$$f(x) = \frac{2}{7}x^2, \qquad g(x) = -x^3$$

○ A: Both I and II are even. ○ B: Both I and II are odd.

○ C: I is even and II is odd. ○ D: I is odd and II is even.

5. If f(x) = x+3 and g(x) = x^2 , for what value of does f(g(x))=g(f(x))

○ A: 1 ○ B: 0

○ C: -1 ○ D: 2

6. Which of the following relations are said to be odd?

$y=x^2 + 1$, $y=\sin(x)$, $y = x^3 - x + 1$

○ A: Only II. ○ B: Only I & II.

○ C: Only I & III. ○ D: Only II & III.

7. Find the inverse of $g(x) = \dfrac{2x}{x-1}$

○ A: $g^{-1}(y) = \dfrac{y+5}{y-2}$ ○ B: $g^{-1}(y) = \dfrac{y}{y-2}$

○ C: $g^{-1}(y) = \dfrac{y-7}{y}$ ○ D: $g^{-1}(y) = \dfrac{y+4}{y-2}$

8. If f(x) = $x^2 + 3x - 4$ and g(x)=x-4, then f(g(x))=

○ A: $2x^2 - 3x + 2$ ○ B: $2x^2 - 3x$

○ C: $x^2 - 5x + 10$ ○ D: $x^2 - 5x$

9. Find $\lim\limits_{x\to1} \dfrac{\sqrt{x}-1}{x-1}$

○ A: ¼ ○ B: 1/2

○ C: 1 ○ D: 2

10. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is correct:

○ A: If $f(x) \geq 0$, then $\lim_{x\to a} f(x) \geq 0$

○ B: If $f(x) \geq g(x)$, then $\lim_{x\to a} f(x) \geq \lim_{x\to a} g(x)$

○ C: If $f(x) \geq 0$, then $\lim_{x\to a} \sqrt{f(x)} = \sqrt{\lim_{x\to a} f(x)}$

○ D: All are correct.

11. If {(3,2),(4,2),(3,1),(7,1),(2,3)} is to be a function, which of the following must be removed from the set?

○ A: (3,2) ○ B: (4,2)

○ C: (2,3) ○ D: None of the above.

12. To show a function is discontinuous, we can do one of three things:

Show that the function fails the sequence definition, Show that the function fails the ε -> δ definition

Prove by contradiction by relating it to a function known to be discontinuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

○ C: None of these are correct. ○ D: (i), (ii) and (iii) are correct.

13. If f(x,y)=x+y and g(x,y)=x-y, then f(g(2,1),f(2,-1)) equals:

○ A: 0 ○ B: 1

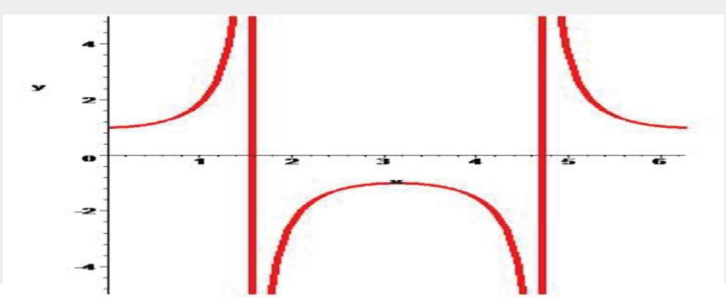
○ C: 2 ○ D: 4

14. Range of the function f(x)= sin (x) is

○ A: [-1,1] ○ B: $[-\frac{\pi}{2}, \frac{\pi}{2}]$

○ C: [0,1] ○ D: None of the above.

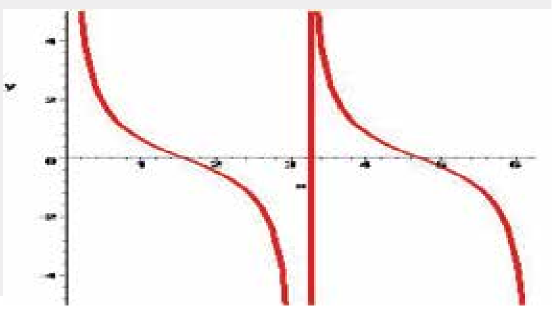
15. The following figure shows a graph of which type of function?



○ A: Tangent ○ B: Secant

○ C: Cosecant ○ D: Cosine

16. The following figure shows a graph of which type of function?



○ A: Cotangent ○ B: Arctangent

○ C: Cosecant ○ D: Tangent

17. f(x)=cos x, g(x)=sin x, h(x) = ±√x

○ A: f(x) is the only function.
○ B: g(x) is the only function.
○ C: f(x) and g(x) are the only function.
○ D: All three are functions.

18. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is not true:

○ A: $\lim_{x\to a}(f(x) \pm g(x)) = \lim_{x\to a} f(x) \pm \lim_{x\to a} g(x)$
○ B: $\lim_{x\to a}(f(x)g(x)) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$
○ C: $\lim_{x\to a} \dfrac{f(x)}{g(x)} = \dfrac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$
○ D: $\lim_{x\to a} |f(x)| = -\left|\lim_{x\to a} f(x)\right|$

19. If $f(x,y) = 2x^2 - y^2$ and $g(x) = 2^x$, which of the following equal 2^{2x} ?

○ A: f(x,g(x))
○ B: f(g(x),x)
○ C: f(g(x),g(x))
○ D: f(g(x),0)

20. If $f(x) = 4x + 2$ for all x, then for x=0.5 $f^{-1}(x) =$?

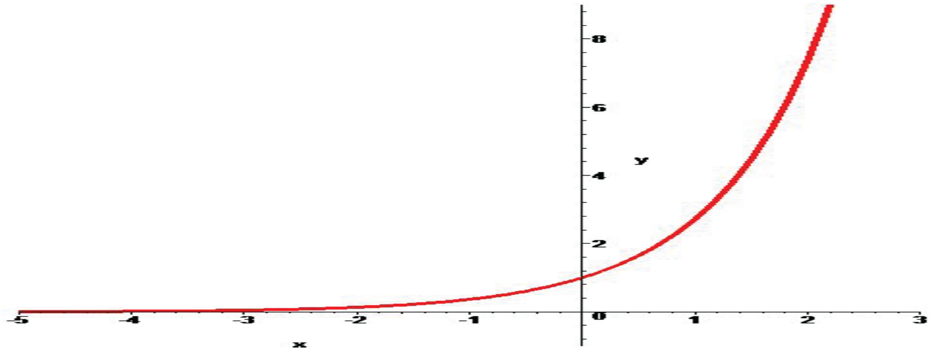
○ A: 4
○ B: $\frac{1}{16}$
○ C: $\frac{1}{4}$
○ D: $-\frac{3}{8}$

TEST 3

1. If g(x-1)= x^2 + 2, then g(x)=

○ A: x^2 - 2x + 3
○ B: x^2 + 2x + 3
○ C: x^2 - 2x + 6
○ D: x^2 - 2x

2. The following figure shows graph of which type of function?



○ A: Log Function
○ B: Exponential Growth
○ C: Exponential Decay
○ D: None of the above.

3. If $f(x) = 3x - 5$ and $g(y) = y^2 - 1$, then f(g(z)) equals

○ A: $(3z-5)^2 - 1$

○ B: $3z^2 - 8$

○ C: $3z^3 - 5z^2 - 3z + 8$

○ D: $x^2 + 3z - 8$

4. $\lim\limits_{x \to 0} \dfrac{\cos(2x) - 1}{\cos x - 1}$ **= ?**

○ A: 2

○ B: 4

○ C: 8

○ D: 10

5. $\lim\limits_{h \to 0} \dfrac{\cos h - 1}{h} =$

○ A: -1

○ B: 0

○ C: 1

○ D: 2

6. $\lim\limits_{x \to 0} \dfrac{x^4 + 5x - 3}{2 - \sqrt{x^2 + 4}}$ **= ?**

○ A: 6

○ B: 15

○ C: ∞

○ D: None of the above.

7. If f(x) = x^2 - 4, for what real number values of x will f(f(x))=0?

○ A: $\sqrt{6}$

○ B: $\pm\sqrt{6}$

○ C: $\pm\sqrt{2} or \pm \sqrt{6}$

○ D: No values

A straight line function, whose graph bisects the second and the fourth quadrants will have a value of .... , when the value of 'x' is 'a'.

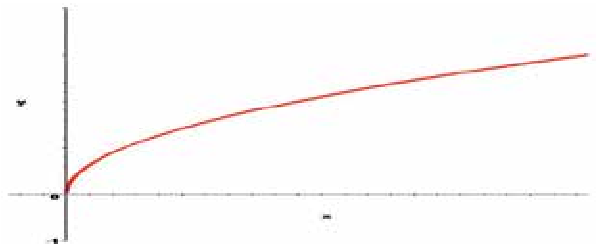
○ A: a

○ B: -a

○ C: -2a

○ D: 0

8. The following figure may show a graph of which function?



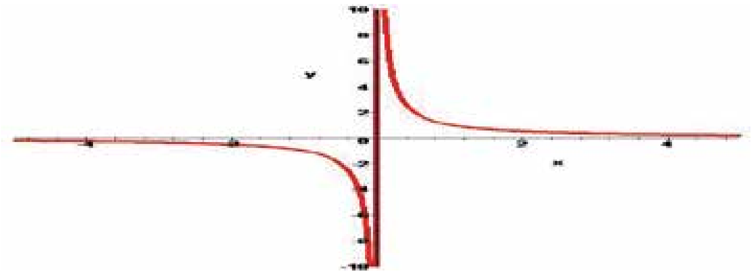
○ A: $y = \sqrt{x}$

○ B: $y = \sqrt[6]{x}$

○ C: $y = \sqrt[5]{x}$

○ D: Both A and B.

9. The figure shown below depicts a graph of which of the following functions?



○ A: y=x+5 ○ B: $y = x^2 / (x+2)$

○ C: $y = x^3 - 4$ ○ D: $y = 1 / x^3$

10. If $f(x) = 2^x$, then $f(\log_2 5)$=

○ A: 2^5 ○ B: 2^2

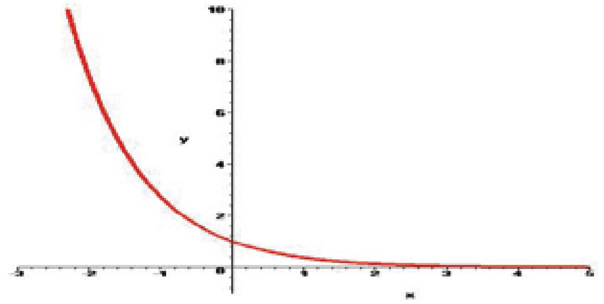
○ C: 2 ○ D: 5

11. If f is a linear function and f(1)=-2,f(-2)=1 and f(x)=1.5, what is x?

○ A: 0.5 ○ B: -0.5

○ C: -1.5 ○ D: -2.5

The wing figure shows a graph of which type of function?



○ A: Log function ○ B: Exponential Growth

○ C: Exponential Decay ○ D: None of the above.

12. If $f(x) = 3 - 2x + x^2$, then $\dfrac{f(x+t) - f(x)}{t}$ equals

○ A: t-x+4 ○ B: t+2

○ C: t+2x-2 ○ D: 2x-2

13. To show a function is continuous, we can do one of three things:

Show it satisfies the sequence definition of continuity, Show it satisfies the ε -> δ definition of continuity

Decompose it into simpler functions we already know to be continuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

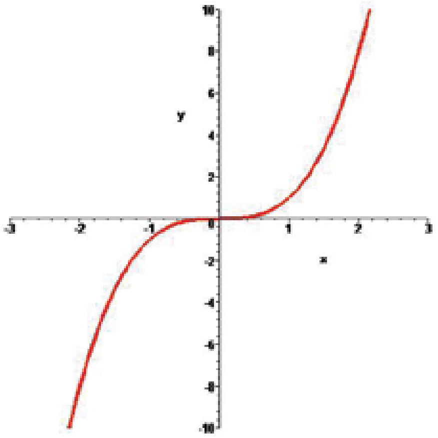
○ C: (i), (ii) and (iii) are correct. ○ D: None of these are correct.

14. **If** $f(x) = \begin{Bmatrix} \frac{5}{x-2} & when & x \neq 2 \\ k & when & x = 2 \end{Bmatrix}$**, what must the value 'k' equal in order that f(x) be a continuous** function?

○ A: 2 ○ B: 5

○ C: 0 ○ D: No value of k will make f(x) a continuous function.

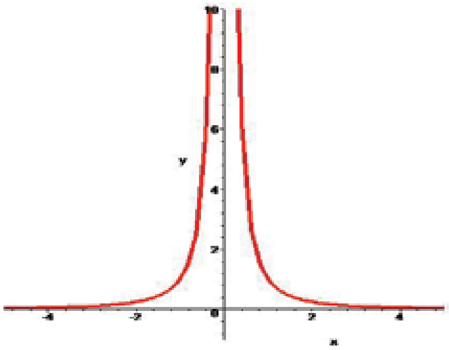
15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the above.

16. The figure shown below depicts a graph of which of the following functions?



○ A: $y = x^2 + 2x + 3$ ○ B: $y = 1 / x^2$

○ C: $y = 1 / x^3$ ○ D: None of the above.

17. If $f(x) = \dfrac{3x-1}{2}$ **and f(g(x))=x, then g(x)=**

○ A: $\dfrac{2x-1}{3}$ ○ B: $\dfrac{2x+1}{3}$

○ C: $\dfrac{2x}{3}+1$ ○ D: $\dfrac{2x}{3}-2$

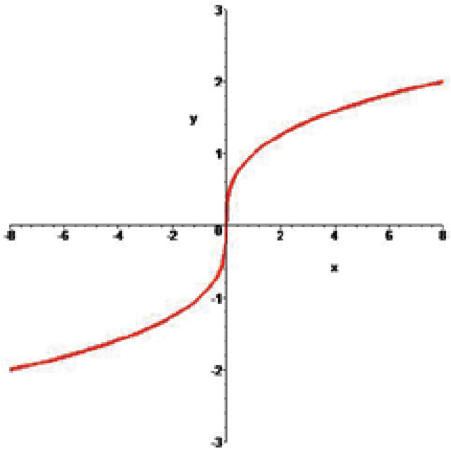
18. A straight line function, whose graph bisects the first and the third quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: 0 ○ B: 1

○ C: a ○ D: 2a

TEST 4

1. **The figure shown may depict a graph of which of the following functions?**



○ A: $y = \sqrt[3]{x}$
○ B: $y = \sqrt[4]{x}$
○ C: Both A and B.
○ D: None of the above.

2. **Find** $\lim\limits_{x \to \infty} \dfrac{x^2 + 5x + 1}{2x^2 - 10}$

○ A: 1/6
○ B: 1/4
○ C: ½
○ D: 1

3. **Domain of the function f(x) = $5x^3 + 4x^2 + 2x - 5$ is:**

○ A: (-∞ , +∞)
○ B: (-4,4)
○ C: (-5,5)
○ D: None of the above.

4. **f={(x,y):y=4}, g={(x,y):$x^2 - y^2$=1}, and h={(x,y):x=3}, which of the these is a function?**

○ A: f only
○ B: g only
○ C: h only
○ D: f and h only

5. **If f(x) = $x^2 + 1$ and f(g(x))=4x-3, then g(x)=**

○ A: $2\sqrt{x} - 1$
○ B: $2\sqrt{x-1}$
○ C: $\sqrt{x-1}$
○ D: x-4

6. **If g(x)=3x+2 and g(f(x))=x, then f(2)=**

○ A: 2
○ B: 6
○ C: 0
○ D: 8

7. **If f(x,y)=2x-y and g(z)=sin z, then** $g(f(\pi, \frac{\pi}{2}))$ **equals:**

○ A: 0
○ B: -1
○ C: 1
○ D: 2

8. Which of the following is the inverse of the function $f(x) = \sqrt{x} - 1$, for all x>0?

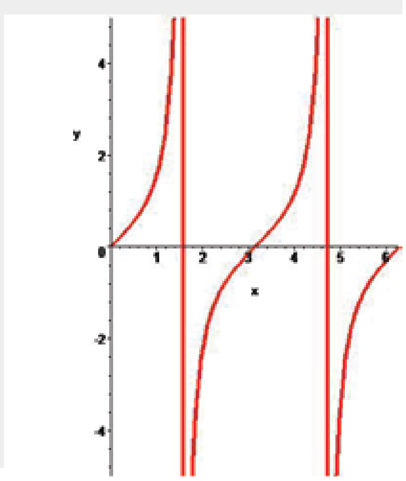
○ A: $(x+1)^2$

○ B: $x^2 + 2$

○ C: x+1

○ D: x-2

9. The following figure shows a graph of which type of function?



○ A: Sine

○ B: Cosine

○ C: Tangent

○ D: Log

10. If $f(x) = x - \frac{1}{x}$, then $f(a) - f(\frac{1}{a})$ equals:

○ A: 0

○ B: 2a - 2/a

○ C: a - 1/a

○ D: 1

11. If f(x)=2x-3, the inverse of f(x) could be represented by:

○ A: $f^{-1}(x) = 3x - 2$

○ B: $f^{-1}(x) = \frac{1}{2x-3}$

○ C: $f^{-1}(x) = \frac{x+2}{3}$

○ D: $f^{-1}(x) = \frac{x+3}{2}$

12. What value(s) must be excluded for the domain of $\frac{f}{g}(x)$ if $f(x) = 3x^2 - 4x + 1$ and $g(x) = 3x^2 - 3$?

○ A: 0

○ B: 3

○ C: 1

○ D: both ±1

13. $\lim\limits_{x=3} = \frac{5x^2 - 8x - 13}{x^2 - 5}$ **= ?**

○ A: 0

○ B: 5

○ C: -2

○ D: 2

14. If f(g(x)) = x^2 - 10 and g(x)=x+3 , then f(x)=

○ A: $x^2 + 6x + 8$

○ B: $x^2 - 6x - 1$

○ C: $x^2 - 6x$

○ D: $x^2 + 8$

15. If f(x)=x, the inverse of f, f^{-1}, could be represented by:

○ A: $f^{-1}(x) = x$

○ B: $f^{-1}(x) = 1$

○ C: $f^{-1}(x) = y$

○ D: $f^{-1}(x) = \frac{1}{x}$

16. If f(x) = x^3 - 4, then the inverse of f=

○ A: $-x^3 + 4$

○ B: $\sqrt[3]{x+4}$

○ C: $\sqrt{x-4}$

○ D: $\frac{1}{x-4}$

17. Find $\lim_{x \to 4} \frac{x^2 - 6x + 8}{x - 4}$.

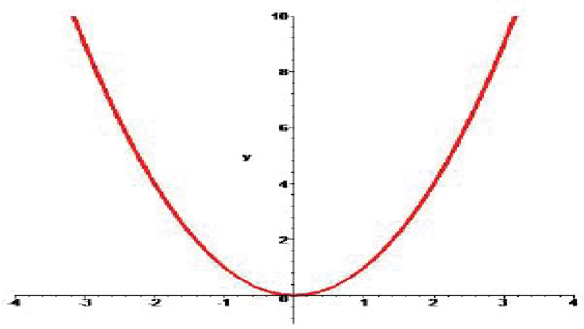
○ A: -2

○ B: 0

○ C: 2

○ D: 4

18. The following figure shows graph of which type of function?



○ A: Linear function

○ B: Even degree polynomial

○ C: Inverse of even degree polynomial

○ D: Inverse of odd degree polynomial

19. Find $\lim_{x \to \infty} \frac{3x^2 + 1}{4x^3 + 2x + 1}$

○ A: 0

○ B: 4

○ C: 10

○ D: 15

20. If f(x) = ax^2 + bx + c and f(1) = 3 and f(-1) = 3, then a+c equals

○ A: -3

○ B: 0

○ C: 3

○ D: 6

Differentiation

TEST 1

1. $\lim_{x \to 0} \frac{1 - \cos x}{x} = ?$

○ A: 1 ○ B: 0
○ C: -1 ○ D: Infinity

2. d/dx f(x).g(x) = ?

○ A: f(x).g(x) ○ B: f'(x).g(x) + f(x).g'(x)
○ C: f'(x).g(x) - f(x).g'(x) ○ D: f'(x).g'(x) + f(x).g(x)

3. d/dx Sin^{-1} x = ?

○ A: $1/(1-x^2)^{1/2}$ ○ B: $- 1/(1-x^2)^{1/2}$
○ C: $1/(1+x^2)^{1/2}$ ○ D: $-1/(1+x^2)^{1/2}$

4. What is the derivative of $(2x + 3)^5$?

○ A: $10(2x + 3)^4$ ○ B: $10(2x + 3)^6$
○ C: $5(2x + 3)^4$ ○ D: $5(2x + 3)^6$

5. dy/dx of f(x) = log(log (x)) is ?

(Please assume log as "Log to the base e" or Ln)

○ A: 1 / log x ○ B: x / log x
○ C: 1 / (x log x) ○ D: 2 / log x

6. $\frac{d}{dx} log(\sin x) = ?$

○ A: tan x ○ B: cot x
○ C: 1 / sin x ○ D: 1 / cos x

7. If $y=e^x$, then the rate of change of y with respect to x at point (0,1) is?

○ A: e ○ B: 1
○ C: -1 ○ D: 2

8. Under which of the following condition the given expression is true?

$$\frac{f(x_1) - f(x)}{x_1 - x} = f'(x)$$

○ A: As x approaches the value of x_1. ○ B: As x_1 approaches the value of x.
○ C: As x approaches the value of 0. ○ D: Both A and B.

9. $\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} = ?$

○ A: f'(x) ○ B: ∫ f(x)dx
○ C: ∫ f'(x)dx ○ D: None of the above.

10. If y = 1/ x^2 then dy/dx at x = -2 is ?

○ A: ¼
○ B: 1
○ C: ½
○ D: -1/2

11. d/dx sin x at x = π/2 is?

○ A: 1
○ B: -1
○ C: √2/2
○ D: 0

12. d/dx ($\cos^2 x + \sin^2 x$) = ?

○ A: 2 sin x + 2 cos x
○ B: 0
○ C: 2 sin x cos x
○ D: 1

13. Which of the following statement is false?

○ A: d/dx c = 0 ; where c is a constant.
○ B: d/dx [c f(x)] = c d/dx f(x)
○ C: d/dx [f(x) * g(x)] = d/dx f(x) * d/dx g(x)
○ D: d/dx [f(x) + g(x)] = d/dx f(x) + d/dx g(x)

14. Who is/or thought to be the inventor of differential calculus and fundamental theorums of calculus?

○ A: Albert Einstien.
○ B: Isaac Newton.
○ C: Gottfried Leibniz
○ D: Both B and C.

15. Derivative of ln e^{4x} w.r.t x is?

○ A: 4
○ B: 4x
○ C: $1/e^{4x}$
○ D: e^{4x}

16. The slope of a curve at point P = 7. If dx = 0.01 and it is very close to P then dy =?

○ A: 0
○ B: 0.7
○ C: 0.07
○ D: 0.49

17. The equation of a line is y = 9/4 x - 33. What is the property of dy/dx?

○ A: It is increasing.
○ B: It is decreasing.
○ C: It is a constant value.
○ D: It is first increasing and then decreasing.

18. $\frac{d}{dx}x^n \; =?$

○ A: nx
○ B: nx^n
○ C: nx^{n-1}
○ D: $1/n+1 \; x^{n+1}$

19. What is the derivative of 1/ $(ax + b)^n$?

○ A: $-n (ax + b)^{-n-1}$
○ B: $- an (ax + b)^{n-1}$
○ C: $-an (ax + b)^{-n-1}$
○ D: $-n (ax + b)^{n-1}$

20. $\lim\limits_{\Delta x\to 0}\frac{f(x+\Delta x)-f(x)}{\Delta x} =?$

○ A: f' (x)
○ B: dy / dx
○ C: ∫ f''(x)dx
○ D: All of the above.

TEST 2

1. **If the tangent to the graph of f(x) at the point "a" makes an angle of 45° with the x-axis, then what is the value of f'(x)?**

   ○ A: 0 ○ B: 1

   ○ C: 2 ○ D: Not enough information.

2. **The function f(x) = cot (x) sin (x) has how many stationary points in the interval [0 , 2π]?**

   ○ A: 0 ○ B: 1

   ○ C: 2 ○ D: 3

3. **Which of the following is the correct expansion of sin x as Maclaurin series?**

   ○ A: $1 - x + x^2 - x^3$ .... ○ B: $x - x^3/3! + x^5/5! - x^7/7!$ .....

   ○ C: $1 + x/1! - 2x/2! + 3x/3!$ ..... ○ D: $1 + 0.1x + 0.01x + 0.001x$ ....

4. **Which of the following is not true?**

   ○ A: $a = d^2s/dt^2$ ○ B: $a = dv/dt$

   ○ C: $v = \int a\, dt$ ○ D: $v = \int s\, dt$

5. $\frac{d}{dx}(\frac{a+x}{a-x}) \; =?$

   ○ A: 0 ○ B: $2(a+x) / (a-x)^2$

   ○ C: $2a / (a-x)^2$ ○ D: $a / (a-x)^2$

6. **What are the two positive integers, whose sum is hundred and product is maximum?**

   ○ A: 30, 70 ○ B: 45, 55

   ○ C: 43, 57 ○ D: 50, 50

7. **Value of e is equal to which of the following infinite series?**

   ○ A: 1 + 1/1! + 1/2! + 1/3! ... ○ B: 1 + 0.1 + 0.01 + 0.001 ...

   ○ C: $1 - 1^3/3! + 1^5/5! - 1^7/7!$ .... ○ D: 1! - 2! + 3! - 4! ...

8. **What is the derivative of $(1 + \tan^2\theta)$ w.r.t tan θ?**

   ○ A: 2 sec θ ○ B: 2 tan θ

   ○ C: $\sec^2 \theta$ ○ D: $2 \tan\theta \sec^2\theta$

9. **Which of the following is not true for function $f(x) = |4 - x^2|$?**

   ○ A: Function value is always positive.

   ○ B: Function is continuous.

   ○ C: Function is differentiable at x = +2 and -2.

   ○ D: Its domain is the set of all real numbers.

10. $\frac{d}{dx}e^{e^x} \; =?$

    ○ A: $e^x e^{e^x}$ ○ B: e^{e^x}

    ○ C: e^{2x} ○ D: $1/e^x$

11. $\frac{d}{dx} tan^{-1} \sqrt{\frac{1 - cos\, x}{1 + cos\, x}}$ =?

○ A: 1 ○ B: 2

○ C: ½ ○ D: -1/2

12. Maximum value of (ln x) / x is ?

○ A: 0 ○ B: 1

○ C: e ○ D: 1/e

The maximum area of a rectangle of perimeter 176 cm is?

○ A: 1854 cm^2 ○ B: 1936 cm^2

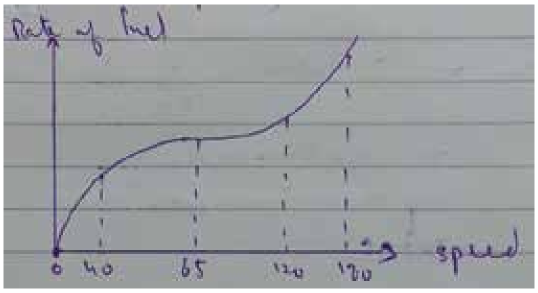
○ C: 2110 cm^2 ○ D: 3246 cm^2

13. What is the derivative of $(x^3+1)^9$?

○ A: $9(x^3+1)^8$ ○ B: $10(x^3+1)^{10}$

○ C: $9x^2 (x^3+1)^8$ ○ D: $27x^2 (x^3+1)^8$

14. The graph below shows the rate of fuel consumption with respect to the speed of the car. What is the most efficient speed with repect to the fuel consumption?



○ A: 40 ○ B: 65

○ C: 120 ○ D: 180

15. Critical point on the graph is the point for which?

○ A: f'(x) = 0 ○ B: f'(x) does not exist

○ C: f'(x) = 1 ○ D: Both A and B.

16. Derivative of an even function is always ?

○ A: An odd function ○ B: An even function

○ C: Negative function ○ D: Could be even or odd

17. If distance s of an object is given by the function $s=100t - 25t^2$, then what is the velocity at t= 1/2?

○ A: 25 ○ B: 50

○ C: 75 ○ D: 100

18. $x^2 + y^2 = 4$ is the equation of a circle. What is the slope at a point where x = 0?

○ A: 0 ○ B: 2

○ C: 4 ○ D: 1/2

19. If y = f(f(x)) ; f(0) = 0 and f'(0) = 1, then y'(0) is equal to ?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 1/2

TEST 3

1. If $y = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \_\_\_ \infty\right)$, then $\frac{dy}{dx} =$

○ A: 0
○ B: 1
○ C: x
○ D: y

2. The function $x^3 + x^2 - 5x - 5$ is increasing at which interval?

○ A: (-infinity , - 5/3]
○ B: [1 , infinity)
○ C: [-5/3 , 1]
○ D: Both A and B.

3. d/dx cos(cos(cos x))) = ?

○ A: -sin [cos (cos x)].sin x cos x
○ B: - cos [sin (sin x)] sin x sin x
○ C: -sin [cos (cos x)] sin (cos x) sin x
○ D: sin [cos (cos x)] cos (cos x)

4. $\frac{d}{dx}[\cos^{-1}(4x^3 - 3x)] = ?$

○ A: $\frac{3}{\sqrt{1-x^2}}$
○ B: $\frac{-3}{\sqrt{1-x^2}}$
○ C: $\frac{3}{\sqrt{1+x^2}}$
○ D: $\frac{-3}{\sqrt{1+x^2}}$

5. y = |cos x| is not differentiable for x = ? (n in the given choices represent a set of integers)

○ A: nπ/2
○ B: (2n+1) π/2
○ C: nπ
○ D: (n+1) π

6. If $y = e^{2x + 3 \log x}$, then dy/dx is equal to?

○ A: $x^2 e^{2x} (2x + 3)$
○ B: $x^2 e^{2x} (2x - 3)$
○ C: $x^3 e^{2x}$
○ D: $x^2 e^{2x}$ 2x

7. If x > 0 and xy = 1, then the minimum value of (x + y) is?

○ A: -2
○ B: -1
○ C: 1
○ D: 2

8. The point at which the curve $y = x^3 - 4x + 3$ has gradient 8 is?

○ A: (2,3)
○ B: (4,5)
○ C: (1,0)
○ D: (0,1)

9. If x = (cos θ + θ sinθ), y = (sinθ - θ cos θ), then dy/dx is equal to ?

○ A: tan θ
○ B: cot θ
○ C: sin θ
○ D: cos θ

10. $\frac{d}{dx}\left(\tan^{-1}\sqrt{\frac{1+\cos x}{1-\cos x}}\right) =?$

○ A: -1
○ B: 1
○ C: ½
○ D: -1/2

11. The graph $f(x)=\cot x$ has critical points at which of the following points in the interval $[0,\pi]$?

○ A: 0 and π
○ B: 0 and π/2
○ C: π and π/2
○ D: π/4 and π/2

12. The minimum value of $(x^2 + 250/x) = ?$

○ A: 75
○ B: 50
○ C: 5
○ D: The function has no minimum value.

13. tan x is ____ function in the interval $[0,\pi/2]$?

○ A: Increasing
○ B: Decreasing
○ C: Constant
○ D: Discontinuous

14. The function $x^3 - 27x + 5$ is increasing when?

○ A: $|x| > 3$
○ B: $|x| < 3$
○ C: $x < -3$
○ D: $x > 3$

15. If $y = \tan^{-1}(\sqrt{1+x^2} + x)$, then $\frac{dy}{dx} = ?$

○ A: $1 / 2(1+x^2)$
○ B: $-1 / 2(1+x^2)$
○ C: $1 / 2(1-x^2)$
○ D: $2 / (1-x^2)$

16. The point on the curve $y = \sqrt{x}$ at which the tangent makes an angle of 45° with x axis is?

○ A: (1,1)
○ B: (1/16,1/4)
○ C: (4,2)
○ D: (1/4, 1/2)

17. If $y = 12x^9 + 13x^7 + 5x^5 +19$ then which of the following is true?

○ A: $d^5y/dx^5 = 0$
○ B: $d^7y/dx^7 = 0$
○ C: $d^9y/dx^9 = 0$
○ D: $d^{10}y/dx^{10} = 0$

18. If $x > 0$, $y > 0$ and $x + y = 18$, then the maximum value of xy is?

○ A: 77
○ B: 81
○ C: 85
○ D: 144

19. If $\sqrt{x} + \sqrt{y} = \sqrt{a}$ then $dy/dx = ?$

○ A: $(y/x)^{1/2}$
○ B: $(x/y)^{1/2}$
○ C: $-(y/x)^{1/2}$
○ D: $-(x/y)^{1/2}$

20. Derivative of $a^{\sqrt{x}} = ?$

○ A: $a^{\sqrt{x}} \ln a$
○ B: $a^{\sqrt{x}}$
○ C: $a^{\sqrt{x}} / \ln a$
○ D: $a^{\sqrt{x}} \ln a / 2\sqrt{x}$

TEST 4

1. **What is $d^{19}y/dx^{19}$ if $y = e^{-x}$?**

○ A: e^{-x}
○ B: $-e^{-x}$
○ C: $19e^{-x}$
○ D: $-19e^{-x}$

2. **The position of an object is given by $x = 15t - 5t^3$ where x is the position. What is the acceleration of the object when it is momentarily at rest?**

○ A: 0
○ B: 1
○ C: 15
○ D: -30

3. **A rectangle has perimeter 100m. Its maximum area would be?**

○ A: 480 m^2
○ B: 625 m^2
○ C: 690 m^2
○ D: 765 m^2

4. **The maximum value of function f(x) = sin x cos x is?**

○ A: 1
○ B: 2
○ C: ½
○ D: 0

5. **If x = log t and $y = t^2 - 1$, then the value of d^2y/dx^2 at t = 1 is?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. **What is the second derivative of $(3t + 2)^{-2}$ with respect to t?**

○ A: $-6(3t + 2)^{-3}$
○ B: $6(3t + 2)^{-4}$
○ C: $54(3t + 2)^{-3}$
○ D: $54(3t + 2)^{-4}$

7. **What is the derivative of sin x w.r.t cos x?**

○ A: cos x
○ B: tan x
○ C: - cot x
○ D: - cos x sin x

8. **d/dx sin x^o = ? (x is in degrees)**

○ A: cos x^o
○ B: x cos x^o
○ C: (- π/180) cos x^o
○ D: (π/180) cos x^o

9. $\frac{d}{dx}e^{ln\, sin\, x^2} \quad =?$

○ A: $2x \cos x^2$
○ B: $x \cos x^2$
○ C: $\cos x^2$
○ D: $1/\sin x * 2\, e^{\sin x}$

10. **If $d/dx\,(3x^3 + x) = d/dx\,(-3x^2 - 5)$ then x = ?**

○ A: 1 or 2
○ B: -1/3
○ C: 0 or -1/3
○ D: 0 or 1

11. **$d(x^x) / dx$ = ?**

○ A: x^x (1 + log x)
○ B: 1 + log x
○ C: log x
○ D: x log x

12. If $y = 3x^2 - 12x + 8$ then the slope of tangent at point (3,-1) is?

○ A: -18
○ B: 6
○ C: -19
○ D: 8

13. The curve $y = \sin(x)$ with domain = set of all real numbers has how many stationary points?

○ A: Infinite
○ B: 0
○ C: 1
○ D: 2

14. The derivative of $e^x \sin x$ w.r.t. e^x is

○ A: cos x + sin x
○ B: cos x
○ C: sin x
○ D: $e^x(\sin x + \cos x)$

15. If $\sin x = \dfrac{t}{\sqrt{1+t^2}}$, then $\dfrac{dx}{dt}$ is equal to

○ A: 1
○ B: $1 / (1+t^2)$
○ C: $1 / (1 - t)^{1/2}$
○ D: $1 / (1 + t^2)^{1/2}$

16. Differentiating $\ln(x^2 + 2x)$ w.r.t x gives?

○ A: $1 / (x^2+2x)$
○ B: $\ln(2x + 2)$
○ C: $(2x+2) / x$
○ D: $(2x+2) / (x^2+2x)$

17. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \ldots \text{to } \infty}}}$, then $\dfrac{dy}{dx}$ is equal to

○ A: $x / (2y - 1)$
○ B: $x / (2y + 1)$
○ C: $\log x / (2y - 1)$
○ D: $1 / x(2y - 1)$

18. If $y = \tan^{-1}\left(\dfrac{\sqrt{1+x^2} - 1}{x}\right)$ and $\theta = \tan^{-1} x$, then $\dfrac{dy}{d\theta} = ?$

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: x/2

19. What is the derivative of $(x^2 + 1)(x^3 + 7)$ w.r.t x is?

○ A: $5x^3 + 15x + 14$
○ B: $5x^4 + 3x^2 + 14x$
○ C: $6x^3$
○ D: $6x^3 + 7$

20. The graph of function $y = x^3$ has a _____ point at x = 0 ?

○ A: Inflection
○ B: Stationary
○ C: Turning
○ D: Both A & B.

Integration

TEST 1

1. **$\int f(x)g'(x)\,dx = ?$**

○ A: $f(x)g(x) - \int g(x)f'(x)\,dx$

○ B: $f(x)g(x) + \int g(x)f'(x)\,dx$

○ C: $f(x)g(x) - \int g'(x)f(x)\,dx$

○ D: $f(x)g(x) + \int g'(x)f(x)\,dx$

2. **$\int \cot x\,dx = ?$**

○ A: ln |cos x| + c

○ B: ln |sec x| + c

○ C: ln |sin x| + c

○ D: ln |cosec x| + c

3. $\int_0^{3\pi/2} cos(x)dx \ =?$

○ A: 0

○ B: 1

○ C: 3

○ D: -1

4. $\int \frac{\tan\sqrt{x}}{\sqrt{x}}\,dx =$

○ A: ln |cos √x|

○ B: 2 ln |cos √x|

○ C: ln |sec √x|

○ D: 2 ln |sec √x|

5. **The solution of the differential equation dy/dx = 2xy is?**

○ A: $y = ce^{-x^2}$

○ B: $y = ce^{x^2}$

○ C: $y^2 = 2x^2 + c$

○ D: None of the above.

6. $\int_0^{\pi} sin(x)dx \ =?$

○ A: 0

○ B: 1

○ C: 2

○ D: √2

7. **$\int (3x^2 - 2x + 1)\,dx = ?$**

○ A: $x^3 - x^2 + 1 + c$

○ B: $x^3 - x + 1 + c$

○ C: $x^3 - x^2 + x + c$

○ D: $x^3 + x^2 + x + c$

$\int \sec x \tan x\,dx =?$

○ A: tan x + c

○ B: cot x + c

○ C: cosec x + c

○ D: sec x + c

8. $\int_{-2}^{3} x^2dx \ =?$

○ A: 8/3

○ B: 19/3

○ C: 28/3

○ D: 35/3

9. If $f(x) = x^2$ then find dy when x = 3 and dx = 0.01?

○ A: 0.02
○ B: 0.04
○ C: 0.06
○ D: 0.08

10. $\int tan^2 x\, dx \;\; =?$

○ A: 2 tan x $\sec^2$ x + c
○ B: tan x + x + c
○ C: tan x - x + c
○ D: None of the above.

11. ∫ $[f(x)]^{-1}$ f'(x)dx = ? (f(x) > 0)

○ A: f(x) + c
○ B: ln | ln f(x) | +c
○ C: ln f(x) + c
○ D: $[f(x)]^{n+1}$ / (n+1)

12. $\int_1^2 (2x^5 - x + 3)dx \;\; =?$

○ A: 45/2
○ B: 39/2
○ C: 17/2
○ D: None of the above.

13. ∫ dx/(ax + b) =?

○ A: ln|ax + b| + c
○ B: 1/a ln|ax + b| + c
○ C: 1/b ln|ax + b| + c
○ D: 1/a ln|a| + c

14. Which of the following mathematical function gives the area under the curve?

○ A: Differentiation
○ B: Integration
○ C: Vector product
○ D: Both B and C.

15. $\int x\, sinx\, dx \;\; =?$

○ A: x sin x + cos x + c
○ B: - x sin x + cos x + c
○ C: x cos x + sin x + c
○ D: - x cos x + sin x + c

16. $\int \frac{x}{(1+x^4)} dx =$

○ A: $\tan^{-1} x^2 + c$
○ B: $1/2 \tan^{-1} x^2 + c$
○ C: $\cot^{-1} x^2 + c$
○ D: $1/2 \cot^{-1} x^2 + c$

17. ∫ $(2x + 3)^{1/2}$ dx = ?

○ A: $1/3\ (2x + 3)^{3/2} + c$
○ B: $1/2\ (2x + 3)^{3/2} + c$
○ C: $1/3\ (2x + 3)^{1/2} + c$
○ D: $2/3\ (2x + 3)^{3/2} + c$

18. ∫ tan x $\sec^2$x dx = ?

○ A: $\sec^2 x / 2 + c$
○ B: $\tan^2 x / 2 + c$
○ C: $\tan^2 x$
○ D: $1/2 (\cos x)^2$

19. What is the solution of the equation?

(sin y) (cosec x) dy/dx = 1

○ A: sin y = sin x + c
○ B: sin y = - sin x + c
○ C: cos y = cos x + c
○ D: cos y = - cos x + c

TEST 2

1. $\int \frac{1 - x^2}{1 + x^2} dx$ **= ?**

○ A: $x + \mathrm{Tan}^{-1} x + c$
○ B: $x - \mathrm{Tan}^{-1} x + c$
○ C: $-x + 2\mathrm{Tan}^{-1} x + c$
○ D: $-x - 2\mathrm{Tan}^{-1} x + c$

2. $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx \;=?$

○ A: 20/3
○ B: 14/3
○ C: 8/3
○ D: 5/3

3. The family of curve $y = Ax + A^3$ is represented by the differential equation of degree?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

4. $\int \frac{\cos x - \sin x}{\cos x + \sin x} dx \;=?$

○ A: - ln (cos x - sin x) + c
○ B: - ln (cos x + sin x) + c
○ C: ln (cos x - sin x) + c
○ D: ln (cos x + sin x) + c

5. $\int \frac{\cos x}{\sqrt{1 + \sin x}} dx = ?$

○ A: $-(1+\sin x)^{1/2} + c$
○ B: $2(1+\sin x)^{1/2} + c$
○ C: $0.5\,(1+\sin x)^{1/2} + c$
○ D: $-0.5\,(1+\sin x)^{1/2} + c$

6. $\int a^{\lambda x + y}\,dx$ **=?**

○ A: $1/(\lambda \ln a)\, a^{\lambda x + y} + c$
○ B: $1/(\ln a)\, a^{\lambda x + y} + c$
○ C: $1/(\lambda \ln a)\, a^{x + y} + c$
○ D: $1/(\ln a)\, a^{x + y} + c$

7. The order of a differential equation whose solution is y = a cos x + b sin x, where a and b are arbitrary constants, is?

○ A: 1
○ B: 2
○ C: 3
○ D: Cannot be determined.

8. $\int x \ln x\, dx = ?$

○ A: $0.5\, x^2 (\ln x - 0.5) + c$
○ B: $x^2 (\ln x + 0.5) + c$
○ C: $1.5\, x (\ln x + 1) + c$
○ D: $x^2 (\ln x - x) + c$

9. The order and the degree of the differential equation $d^2s/dt^2 + 4 = 0$ are?

○ A: Order is 2 and degree is 2
○ B: Order is 2 and degree is 3
○ C: Order is 1 and degree is 2
○ D: None of the above.

10. $\int \ln(\tan x) \sec^2 x\, dx = ?$

○ A: ln (tan x) + tan x + c
○ B: tan x ln (tan x) - tan x + c
○ C: ln (tan x) - sec x + c
○ D: tan x ln (tan x) + tan x + c

11. $\int \frac{1-\tan^2 x}{1+\tan^2 x}\,dx =$

○ A: sin 2x ○ B: 1/2 sin 2x
○ C: cos 2x ○ D: 1/2 cos 2x

12. The solution of the differential equation $\frac{dy}{dx} + \frac{1+\cos 2y}{1-\cos 2x} = 0$ is

○ A: tan y + cot x = c ○ B: tan y . cot x = c
○ C: tan y - cot x = c ○ D: tan y = c . cot x

13. Which of the following is an ordinary differential equation?

○ A: $2y + 8x = \frac{d(cosx)}{dx}$ ○ B: $\frac{d(y+x)}{dx} = x^2 + sin\,x$
○ C: $\frac{d(cos\,x + tan\,x)}{dx} = x + 2y$ ○ D: All of the above.

14. ∫ $\sec^2$x cosec^2x dx = ?

○ A: tan x cot x ○ B: tan x + cot x
○ C: tan x - cot x ○ D: - tan x cot x

15. ∫ $\tan^2$ x dx = ?

○ A: tan x + x + c ○ B: tan x - x + c
○ C: $\sec^2$ x - x + c ○ D: cosec^2 x + x + c

16. $\int \frac{1}{(1+x^2)Tan^{-1}x}dx \ =?$

○ A: 1/x ln |Tan^{-1} x| + c ○ B: -1/x ln |Tan^{-1} x| + c
○ C: - ln |Tan^{-1} x| + c ○ D: ln |Tan^{-1} x| + c

17. The solution of the differential equation y dy/dx = x - 1, satisfying x = 1 and y = 1, is?

○ A: $y^2 = 2x^2 - x – 1$ ○ B: $y^2 = x^2 - 2x + 2$
○ C: $y = x^2 - 2x + 3$ ○ D: $y^2 = 2x^2 - x - 3$

18. $\int ln\,x\,dx \ =?$

○ A: x (1 – ln x) + C ○ B: x (ln x - 1) + C
○ C: (1 + x) ln x + C ○ D: (1 - x) ln x + C

19. A particle moves in a straight line with a velocity given by dx/dt = x + 1 (x is the distance described). The time taken by a particle to traverse a distance of 99 meters is?

○ A: log 10e ○ B: 2 $\log_e$ 10
○ C: 2 log 10 e ○ D: 0.05 log10 e

20. The number of arbitrary constants in the second order differential euqation is?

○ A: 0 ○ B: 1
○ C: 2 ○ D: Infinite

TEST 3

1. $\int \frac{cos2x - 1}{1 + cos2x} dx \ \ =?$

○ A: $- \tan x + x + c$

○ B: $\tan x + x + c$

○ C: $x - \sec x + c$

○ D: $x + \sec x + c$

2. $\int e^{-ln\, x}\, dx \ \ =?$

○ A: $e^{-\ln x}$

○ B: $\ln |x|$

○ C: $-e^{-\ln x}$

○ D: $-x\, e^{-\ln x}$

3. $\int_0^1 \frac{dx}{(1+x^2)^{3/2}} \ \ =?$

○ A: 1

○ B: $\sqrt{2}$

○ C: $1/\sqrt{2}$

○ D: $3/\sqrt{2}$

4. The solution of the equation $(e^x + 1)y\, dy = (y + 1)e^x\, dx$ is ?

○ A: $y = e^x(e^x + 1) + C$

○ B: $(y + 1) = e^{2x} + C$

○ C: $y = e^x / x + C$

○ D: $C\,(1 + y)(1 + e^x) = e^y$

5. The differential equation of all circles of radius 'r' is of order?

○ A: 1

○ B: 2

○ C: 3

○ D: 4

6. What is the solution of the differential equation,

$(x\sqrt{1+y^2})dx + (y\sqrt{1+x^2})dy = 0$

○ A: $(1+y^2)^{1/2} + (1 + x^2)^{1/2} = c$

○ B: $\log (1 + y^2) + \log (1 + x^2) = 2c$

○ C: $\sin^{-1} y + \sin^{-1} x = c$

○ D: $\tan^{-1} y + \tan^{-1} x = c$

7. $\int \frac{e^{tan^{-1}x} dx}{1 + x^2}$ **= ?**

○ A: $xe^{tan^{-1}x} + c$

○ B: $(tan^{-1}x)e^{tan^{-1}x} + c$

○ C: $tan^{-1}x + c$

○ D: $e^{tan^{-1}x} + c$

8. $\int_0^{2\pi} cos^2\theta\, d\theta \ \ =?$

○ A: π

○ B: 2π

○ C: $3\pi/2$

○ D: 3

9. $\int_0^{\pi} \sqrt{1 + sin\ x}\, dx \ \ =?$

○ A: 2

○ B: 4

○ C: $\sqrt{2}$

○ D: $2\sqrt{2}$

10. $\int |x|\, dx = ?$

○ A: $x^2 / 2$

○ B: $- x^2 / 2$

○ C: $x |x| / 2$

○ D: 1

11. $\int \frac{\sec x \operatorname{cosec} x}{\log \tan x} dx =$

○ A: $\log [\log \tan x] + C$

○ B: $\cot (\log x) + C$

○ C: $\tan (\log x) + C$

○ D: None of the above.

12. If $\int x^6 \sin(5x^7) dx = \frac{k}{5} \cos(5x^7), x \neq 0$, then

○ A: $k = -1/7$

○ B: $k = 1/7$

○ C: $k = -7$

○ D: $k = 7$

13. $\int \frac{dx}{e^x + e^{-x}} \quad =?$

○ A: $\log (e^x + 1) + C$

○ B: $\log (e^x + e^{-x}) + C$

○ C: $\tan^{-1} e^x + C$

○ D: $\sin^{-1} e^x + C$

14. The value of $\int \frac{(x - x^3)^{1/3}}{x^4} dx$ is

○ A: $(3/8) (1/x^2 - 1)^{4/3} + C$

○ B: $- (3/8) [(1/x^2) - 1]^{4/3} + C$

○ C: $(1/8) (1 - 1/x^2)^{4/3} + C$

○ D: $- (1/8) (1 - 1/x^2)^{4/3} + C$

15. $\int \frac{\cos x}{\sin x \,.\, \ln \sin x} dx \quad =?$

○ A: $- \ln |\ln \sin x|\, dx$

○ B: $- \ln |\ln \cos x|\, dx$

○ C: $\ln |\ln \sin x|\, dx$

○ D: $\ln |\ln \cos x|\, dx$

16. $\int_0^{2\pi} \sqrt{1 + \sin(x/2)}\, dx \quad =?$

○ A: 2

○ B: 4

○ C: 8

○ D: 0

17. $\int \sin^{-1} x\, dx \quad =?$

○ A: $x \cos^{-1} x + (1 - x^2)^{1/2} + C$

○ B: $x \sin^{-1} x + C$

○ C: $x \sin^{-1} x + (1 - x^2)^{1/2} + C$

○ D: $- \sin^{-1} x + (1 - x^2)^{1/2} + C$

18. $\int_0^{\pi/2} \sin x\, e^{\cos x} dx \quad =?$

○ A: 1

○ B: e - 1

○ C: e

○ D: -1

19. $\int \frac{xe^x}{(1+x)^2}dx \;=?$

○ A: $(1 + 2x\, e^x) / (1 + x)$

○ B: $(1 - 2x\, e^x) / (1 + x)$

○ C: $- e^x / (1+x)$

○ D: $e^x / (1+x)$

20. The equation of the curve through the point (1, 0) and whose slope is $\frac{y-1}{x^2-x}$ is

○ A: $(y - 1)(x + 1) + 2x = 0$

○ B: $2x(y - 1) + x + 1 = 0$

○ C: $x(y - 1)(x + 1) + 2 = 0$

○ D: $y(y - 1)(x - 1) + 2 = 0$

TEST 4

1. $\int \sqrt{1 + cos(x/4)}\, dx \;=?$

○ A: $8\sqrt{2} \sin (x/8) + C$

○ B: $- 8\sqrt{2} \sin (x/8) + C$

○ C: $8\sqrt{2} \cos (x/8) + C$

○ D: $- 8\sqrt{2} \cos (x/8) + C$

2. $\int_0^{\pi/2} sin^2 x\, dx \;=?$

○ A: π

○ B: π/2

○ C: π/3

○ D: π/4

3. $\int_0^{\pi} \sqrt{1 - cos\, x}\, dx \;=?$

○ A: 1

○ B: $\sqrt{2}$

○ C: $2\sqrt{2}$

○ D: 2

4. $\int_0^{\pi/2} sin(x) sin(2x) dx \;=?$

○ A: 1/3

○ B: 2/3

○ C: 1

○ D: pi

5. Which of the following statement is false?

○ A: The degree of the differential equation is the highest power of the highest order differential coefficient occurring in it.

○ B: The order of the differential equation is the highest order derivative occurring in the equation.

○ C: The order of a differential equation is unique.

○ D: The order of a differential equation is any integer.

6. $\int \cos \sqrt{x}\, dx = ?$

○ A: $[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$

○ B: $2[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$

○ C: $[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$

○ D: $2[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$

7. The differential equation $x\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y = x^2$ is of

○ A: Degree 4 and order 2 ○ B: Degree 4 and order 3

○ C: Degree 3 and order 2 ○ D: Degree 2 and order 3

8. What is the solution of the differential equation?

$x\,dy + y(x - 1)dx = 0$

○ A: $y = c\,xe^{x}$ ○ B: $y = c\,xe^{-x}$

○ C: $y = c\,e^{-x}$ ○ D: $y = c\,xe^{x+1}$

9. $\int [f(x)]^n f'(x)\,dx = ?$

○ A: $\ln f(x) + c$ ○ B: $-\ln f(x) + c$

○ C: $[f(x)]^{n+1} / (n+1)$ ○ D: $[f(x)]^{n} / (n+1)$

10. $\int x^2 e^{x^3} \cos(e^{x^3})dx$ is equal to

○ A: $\frac{1}{3}sin(e^{x^3}) + c$ ○ B: $sin(e^{x^3}) + c$

○ C: $3sin(e^{x^3}) + c$ ○ D: $-sin(e^{x^3}) + c$

11. If $dr/dt = -rt$ and $r(0) = r_0$, then which of the following is correct?

○ A: $r = r_o e^{-t}$ ○ B: $r = r_o e^{-t/2}$

○ C: $r = r_o e^{-t.t}$ ○ D: $r = r_o e^{-t.t/2}$

12. $\int \frac{e^{2x} + e^{x}}{e^{x}} dx \;=?$

○ A: $e^{x} + 1 + c$ ○ B: $2x\,e^{x} + c$

○ C: $e^{2x} + 1 + c$ ○ D: $e^{x} + x + c$

13. δy for any function $f(x)$ is given by?

○ A: $f(\delta x)$ ○ B: $f(x + \delta x)$

○ C: $f(x + \delta x) + f(x)$ ○ D: $f(x + \delta x) - f(x)$

14. $\int_0^{\pi/2} cos^2 x\,dx \;=?$

○ A: π ○ B: $\pi/2$

○ C: $\pi/3$ ○ D: $\pi/4$

15. The solution of the equation $y\,dx + x\,dy = 0$ is?

○ A: $xy = c$ ○ B: $x/y = c$

○ C: $x + y = c$ ○ D: $x - y = c$

Analytic Geometry

TEST 1

1. Equation of a line parallel to x axis at a distance 'a' below the x axis is?

○ A: $x = a$
○ B: $x = -a$
○ C: $y = -a$
○ D: $y = a$

2. What is the equation of a line perpendicular to a line with slope = -6? The line has y intercept of 4/3.

○ A: $y = x + 8$
○ B: $y = -6x + 4/3$
○ C: $6y = x + 8$
○ D: $y = x + 3/4$

3. The angle bisectors of a triangle are?

○ A: Perpendicular
○ B: Concurrent
○ C: Non-concurrent
○ D: Parallel

4. The equation of family of lines perpendicular to line $3x + 4y + 7 = 0$, is?

○ A: $4x + 3y + k = 0$
○ B: $4x - 3y + k = 0$
○ C: $3x - 4y + k = 0$
○ D: $3x + 4y + k = 0$

5. If m_1 and m_2 are the slopes of the perpendicular lines. Which of the following is true?

○ A: $m_1 = m$
○ B: $m_1 = -m_2$
○ C: $m_1m_2 - 1 = 0$
○ D: $m_1m_2 + 1 = 0$

6. Angle between lines $2x^2 - 7xy + 3y^2 = 0$, is?

○ A: 45°
○ B: 60°
○ C: 90°
○ D: 30°

7. What is the distance between the points A (7,5) and B (2,-6) ?

○ A: $\sqrt{73}$
○ B: $\sqrt{146}$
○ C: $\sqrt{183}$
○ D: $\sqrt{219}$

8. Equation of x axis is?

○ A: $y = 0$
○ B: $x = 0$
○ C: $x = y$
○ D: $y = 1$

9. What is the y intercept of the line $x - \sqrt{3}y + 10 = 0$

○ A: $10/\sqrt{3}$
○ B: $-10/\sqrt{3}$
○ C: 10
○ D: -10

10. The mid point of line joining points A (3 ,1) and B(-2,-4) is?

○ A: (5/2 , 5/2)
○ B: (3/2, 1/2)
○ C: (-1, -2)
○ D: (1/2 , -3/2)

11. If inclination of a line is 45° then the slope is?

○ A: 0
○ B: 1
○ C: -1
○ D: Infinity.

12. The point (-4,-2) lies on a circle. What is the length of the radius of this circle if the center is located at (-8,-10)?

○ A: $\sqrt{47}$
○ B: $\sqrt{80}$
○ C: $\sqrt{95}$
○ D: $\sqrt{108}$

13. If two medians of a triangle ABC pass through point (1,-2) then the third median pass through?

○ A: (0,0)
○ B: (-2,1)
○ C: (-1,-2)
○ D: None of the above.

14. Which of the following statement is true about any triangle?

○ A: Altitudes and right bisectors are concurrent.
○ B: Altitudes and right bisectors are non-concurrent.
○ C: Altitudes are concurrent and right bisectors are not concurrent.
○ D: Altitudes are not concurrent and right bisectors are concurrent.

15. If m_1 and m_2 are the slopes of two lines then the tangent of angle between the lines is equal to?

○ A: $(m_2 - m_1) / (1 - m_1m_2)$
○ B: $(m_2 + m_1) / (1+m_1m_2)$
○ C: $(m_2 + m_1) / (1 - m_1m_2)$
○ D: $(m_2 - m_1) / (1+m_1m_2)$

16. In the straight equation x cos a + y sin a = P, P represents?

○ A: Y intercept
○ B: X intercept
○ C: Mid point of the line.
○ D: Length of perpendicular from the origin to the line

17. What is the point of intersection for 5x + 7y = 35 and 3x - 7y = 21?

○ A: (5,7)
○ B: (7,0)
○ C: (3,-7)
○ D: (4,3)

18. If points A(a,b) ; B(c,d) and C(e,f) are collinear. Then the area of the triangle ABC is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

19. The point p (x,y) such that x>0 and y <0 lies in?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

20. What is the slope of the line ax + by + c = 0?

○ A: 0
○ B: Infinite
○ C: -c/b
○ D: -a/b

TEST 2

1. **What is the symmetric form of the equation $5x - 12y + 39 = 0$?**

○ A: $\frac{x + 39/5}{12/13} = \frac{y}{5/13}$ ○ B: $(-5/13)x + (12/13)y = 3$

○ C: $(-5/39)x + (12/39)y = 1$ ○ D: $y = (5/12)x + (39/12)$

2. **The equation of line parallel to x-axis and bisecting the join of (1, 4) and (− 2, 6) is?**

○ A: $y = 3$ ○ B: $y = 5$

○ C: $y + 2 = 5$ ○ D: $x = 5$

3. **What is the equation of a line passing through the point (4,2) and parallel to the line connecting points (0,-1) and (7,-15)?**

○ A: $y + 2x + 10 = 0$ ○ B: $y + 2x - 10 = 0$

○ C: $2y + 3x - 7 = 0$ ○ D: $2y + 3x + 7 = 0$

4. **The two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if?**

○ A: $a_1b_2 - a_2b_1 = 0$ ○ B: $a_1a_2 - b_1b_2 = 0$

○ C: $a_1b_2 + a_2b_1 = 0$ ○ D: $a_1a_2 + b_1b_2 = 0$

5. **The three lines $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if and only if?**

○ A: $a_1 = a_2 = a_3$ and $b_1 = b_2 = b_3$ and $c_1 = c_2 = c_3$

○ B: $a_1 + b_1 + c_1 = 0$ ○ C:

○ D:

6. **If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then?**

○ A: $a = 0, b = 4$ ○ B: $a = 3, b = 4$

○ C: $a = 2, b = 3$ ○ D: $a = 3, b = 5$

7. **The equation of general form $ax^2 + 2hxy + by^2$ represents?**

○ A: A line ○ B: A curve

○ C: A pair of lines ○ D: A pair of lines through the origin

8. **Centroid of a triangle divides each median in the ratio?**

○ A: 1:1 ○ B: 1:2

○ C: 2:1 ○ D: 1:3

9. **Find the radius of a circle whose diameter has endpoints (-3, -2) and (7, 8)?**

○ A: $10\sqrt{2}$ ○ B: $2\sqrt{10}$

○ C: $5\sqrt{2}$ ○ D: $2\sqrt{5}$

10. **The angle between the pair of lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$ is?**

○ A: None of the above. ○ B: $\tan^{-1}(4/3)$

○ C: $\tan^{-1}(11/3)$ ○ D: $\tan^{-1}(7/3)$

11. Of $P_1(x_1,y_1)$ and $P_2=(x_2,y_2)$ are two points such that line joining P_1P_2 is parallel to x axis then?

○ A: $x_1 = x_2$ ○ B: $y_1 = x_2$

○ C: $x_1 = y_2$ ○ D: $y_1 = y_2$

12. The equation of a straight line that intersects x axis at point 2 and y axis at point -4 is?

○ A: y - 2x + 4 = 0 ○ B: y - 2x - 4 = 0

○ C: 2x - y + 4 = 0 ○ D: x - 2y + 4 = 0

13. For a pair of lines represented by general equation $ax^2 + 2hxy + by^2$, if $h^2 > ab$ then?

○ A: Lines are real and distinct. ○ B: Lines are real and coincident.

○ C: Lines are imaginary. ○ D: Lines do not pass through the origin.

14. What is the equation of the line intersecting 3x - 4y - 10 = 0 and x + 2y - 10 = 0 and having a zero slope?

○ A: 2x + 3y - 18 = 0 ○ B: y = 2

○ C: x = 9 ○ D: 2x + 3y + 18 = 0

15. Slope of a line is negative if the angle z it froms with the x axis is?

○ A: z = 0 ○ B: z > 90

○ C: 0 < z < 90 ○ D: 90 < z < 180

16. If three points A(a,b), B(c,d) and C(e,f) are collinear then?

○ A: Slope of AB is not equal to the slope of BC

○ B: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$ ○ C: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 1$

○ D: None of the above.

17. The equation below shows which form of the straight line equation?

$$\frac{x - x_1}{cos\,\alpha} = \frac{y - y_1}{sin\,\alpha}$$

○ A: Normal form ○ B: Two point form

○ C: Symmetric form ○ D: Point slope form

18. What is the distance between two parallel lines 2x - 5y + 13 = 0 and 2x - 5y + 6 = 0?

○ A: 3/28 ○ B: 9/32

○ C: 7/√29 ○ D: 4/√63

19. What is the normal form of the straight line equation 5x - 12y + 39 = 0?

○ A: This equation cannot be represented in the two point form.

○ B: y = (5/12) x + 39/12 ○ C: (-5/39) x + (12/39) y = 1

○ D: (-5/13) x + (12/13) y = 3

20. The points of line |x| = |y| may lie in which quadrant?

○ A: Quadrant I ○ B: Quadrant I & III

○ C: Quadrant II and IV ○ D: Quadrant I, II , III or IV

TEST 3

1. Find the value of k in the equation $(3x - 4y - 10) + k(x + 2y - 10) = 0$ such that the line is perpendicular to a line with slope 3/4?

○ A: 4 ○ B: 5

○ C: 6 ○ D: 7

2. The pair of lines represented by the equation $2x^2 + 49xy - 2y^2$are?

○ A: Imaginary. ○ B: Parallel

○ C: Perpendicular ○ D: None of the above.

3. The straight lines given below form what kind of triangle?

$x + y - 4 = 0$, $3x + y - 4 = 0$, $x + 3y - 4 = 0$

○ A: Isoceles ○ B: Equlateral

○ C: Right angled ○ D: None of the above.

4. Pair of lines represented by the equation $2x^2 + 8xy + 8y^2$ are?

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imginary. ○ D: None of the above.

5. What is the value of h such that points (-1,h) , (3,2) and (7,3) are collinear?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. The lines $px + qy + r = 0$, $qx + ry + p = 0$, $rx + py + q = 0$ are concurrent if?

○ A: $p + q + r = 0$ ○ B: $p^2 + q^2 + r^2 + pq + qr + rp = 0$

○ C: $p^2 + q^2 + r^2 + 3pqr = 0$ ○ D: All of the above.

7. The equation of base of an equilateral triangle is $x + y = 2$ and the vertex opposite to this base is $(2, -1)$. Then the length of the side of triangle equals?

○ A: $\sqrt{3}$ ○ B: $\sqrt{1} / \sqrt{3}$

○ C: $\sqrt{2} / \sqrt{3}$ ○ D: $\sqrt{3} / \sqrt{2}$

8. For a pair of Imaginary lines represented by the equation $ax^2 + 2hxy + by^2$. Which of the following is true?

○ A: The imaginary lines never intersect.

○ B: They intersect at (0,0) ○ C: They intersect at postivie y axis.

○ D: They intersect at negative y axis.

9. If vertices of triangle ABC are A(2,2), B(-4,-4) and C(5,-8). Then the length of median through C is?

○ A: $\sqrt{65}$ ○ B: $\sqrt{75}$

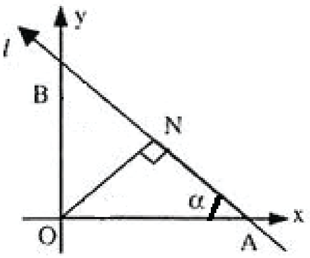
○ C: $\sqrt{85}$ ○ D: $\sqrt{95}$

10. For a pair of lines represented by the equation $3x^2 + 4xy + 9y^2$, the lines are?

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imaginary. ○ D: Not passing through the origin.

11. What the equation of a line at a distance 5 units from the origin, having angle $\alpha = 30^o$ as shown in the figure below?



○ A: $\sqrt{3}x + y = 10$ ○ B: $x + \sqrt{3}y = 10$

○ C: $\sqrt{3}x + y = 5$ ○ D: $x + \sqrt{3}y = 5$

12. Which of the following is true about the two points (0,0) and (-4,7) with respect to the line $2x - 3y + 6 = 0$?

○ A: They both lie on the line. ○ B: They both lie above the line.

○ C: They both lie below the line. ○ D: They lie on the opposite sides of the line.

13. What is the radius of circle inscribed in the triangle formed by lines $x = 0$, $y = 0$ and $4x + 3y - 24 = 0$?

○ A: 2 ○ B: $2\sqrt{2}$

○ C: 3 ○ D: 4

14. Equation of the right bisector of the line segment joining points (7,4) and (-1,-2) is?

○ A: $4x + 3y - 10 = 0$ ○ B: $4x + 3y - 15 = 0$

○ C: $3x - 4y + 7 = 0$ ○ D: $3x - 4y - 7 = 0$

15. The line segment joining the point (-3,-4) and (1,-2) is divided by the y axis in ratio?

○ A: 1:1 ○ B: 2:1

○ C: 3:1 ○ D: 4:1

16. If the coordinates of the mid point of the triangle are (1,-1), (2,3) and (3,2) then the area of triangle is?

○ A: 3/2 ○ B: 9/2

○ C: 6 ○ D: 11/2

17. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form which of the following triangles?

○ A: Isoceles ○ B: Equilateral

○ C: Right Angled ○ D: None of the above.

18. Points A(1, 3) and C(5, 1) are opposite vertices of a rectangle ABCD. If the slope of BD is 2, then its equation is

○ A: $2x - y = 4$ ○ B: $2x + y = 4$

○ C: $2x + y = 7$ ○ D: $2x - y = -7$

19. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product then c has the value?

○ A: -1 ○ B: 1

○ C: -2 ○ D: 2

20. Equation of the line passing through the point (1,-2) and cutting off equal intercepts from the axis would be?

○ A: $x + y = 1$
○ B: $x + y + 1 = 0$
○ C: $x - y = 1$
○ D: $x - y + 1 = 0$

TEST 4

1. For a pair of lines represented by the equation $ax^2 + 2hxy + by^2$, which of the following is true if the lines are parallel?

○ A: $h^2 = 0$
○ B: $h^2 > ab$
○ C: $h^2 < ab$
○ D: $h^2 - ab = 0$

2. If point A (-1,2) is the center of a circle and point B (7,5) lies on the circle. The diameter of circle is?

○ A: 9
○ B: $\sqrt{45}$.
○ C: $\sqrt{73}$.
○ D: $2\sqrt{73}$

3. The coordinate axis is changed through the point O' (2,3). If coordinates of a point P in new axis are (-1,4) then the original coordinates of P were?

○ A: (0,0)
○ B: (2,3)
○ C: (1,7)
○ D: (3,-1)

4. The point P (x,y) with $x<0$ and $y<0$ lies in which quadrant?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

5. What are the new coordinates of the point P(5,3), if the axis is rotated by angle 45°?

○ A: (4,2)
○ B: $(\sqrt{2}, 2\sqrt{2})$
○ C: $(2\sqrt{2}, -\sqrt{2})$
○ D: $(4\sqrt{2}, -\sqrt{2})$

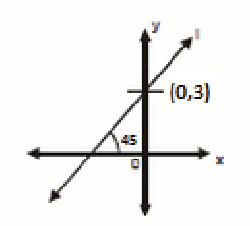
6. Inclination of the line $y = -x$ is?

○ A: 45°
○ B: 135°
○ C: 225°
○ D: 315°

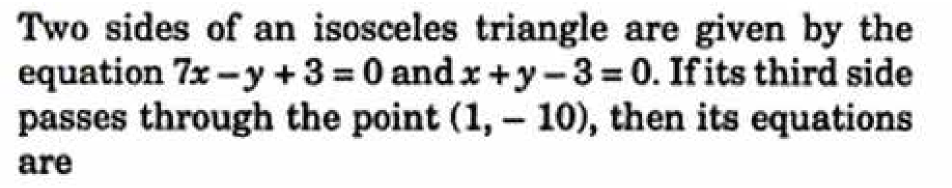
7. What is the angle between the lines L_1 joining points (1,-7) and (6,-4) and L_2 joining points (-1,2) and (-6,-1)?

○ A: 0
○ B: 30
○ C: 45
○ D: 60

8. The equation of the line given below is?



○ A: $y = 3x - 1$
○ B: $y = 3x + 1$
○ C: $y + x = 3$
○ D: $y = x + 3$

9. 

Two sides of an isosceles triangle are given by the equation $7x - y + 3 = 0$ and $x + y - 3 = 0$. If its third side passes through the point (1, – 10), then its equations are

○ A: x - 3y - 31 = 0 or 3x + y + 7 = 0 ○ B: x - y - 31 = 0 or x + y + 7 = 0

○ C: 2x - 3y - 11 = 0 or x + 4y + 9 = 0 ○ D: x + y + 1 = 0 or 5x - y + 10 = 0

10. Equation of the line through the point (2,3) and perpendicular to the line joining (-5,6) and (-6,5) is given by?

○ A: x - y + 5 = 0 ○ B: x + y + 5 = 0

○ C: x - y - 5 = 0 ○ D: x + y - 5 = 0

11. The extremities of diagonal of a parallelogram are the points (3, − 4) and (− 6, 5). If the third vertex is (− 2, 1), then the fourth vertex will be?

○ A: (0,1) ○ B: (1,0)

○ C: (1,1) ○ D: (-1,0)

12. Orthocenter of a triangle is defined as the point of intersection of?

○ A: Altitudes ○ B: Angle bisectors

○ C: Medians ○ D: None of the above.

13. If the lines represented by equation $Ax^2 + 2Hxy + By^2 = 0$ are perpendicular, then?

○ A: A + H = 0 ○ B: A + B = 0

○ C: H = 0 ○ D: A/B = H/B

14. What is the equation of the lines passing through the point (-5,-3) and (9,-1) ?

○ A: x - 7y - 16 = 0 ○ B: x - 7y + 16 = 0

○ C: x + 7y + 16 = 0 ○ D: x + 7y - 20 = 0

15. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. Then PQRS must be a?

○ A: General parallelogram ○ B: Rectangle

○ C: Rhombus ○ D: None of the above.

16. A line passes through point (4, 1) and is perpendicular to line 3x + y = 3, then its x − intercept is?

○ A: ½ ○ B: 2/3

○ C: 1 ○ D: 3/2

17. The line passing through point (1,2) and perpendicular to x + y + 1 = 0 is?

○ A: y - x + 1 = 0 ○ B: y - x - 1 = 0

○ C: y - x + 2 = 0 ○ D: y - x - 2 = 0

18. Distance between two lines defined by x + 3 = 0 and x - 3 = 0 is?

○ A: 0 ○ B: 3

○ C: 6 ○ D: 9

19. M is the midpoint of line AB. The coordinates of A are (-2,3) and the coordinates of M are (1,0). The coordinates of B are?

○ A: (-1/2,3/2)
○ B: (4,-3)
○ C: (4,6)
○ D: (-4,-3)

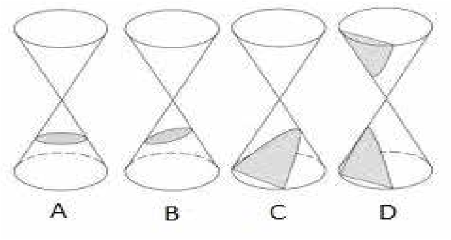
20. If a line passing through the points (x_1 , y_1) and (x_2 , y_2) such that $x_1 = x_2$ then the slope of the line is?

○ A: Zero
○ B: Positive
○ C: Negative
○ D: Undefined

Conic Sections

TEST 1

1. **Which of the following cutting of a cone represents a circle?**



○ A: A
○ B: B
○ C: C
○ D: D

2. **Eccentricity of ellipse is?**

○ A: Equal to 1.
○ B: Greater than zero and less than 1.
○ C: Greater than one.
○ D: Zero

3. **Center and radius of the circle represented by $x^2 + y^2 = 9$ is?**

○ A: (1,1) and 9
○ B: (1,1) and 3
○ C: (0,0) and 9
○ D: (0,0) and 3

4. **Equation of a circle cannot have a term?**

○ A: x
○ B: y
○ C: xy
○ D: All of the above.

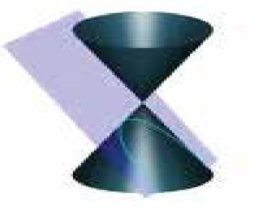
5. **The center of the circle represented by the equation $(x - 3)^2 + (y + 4)^2 = 4$ is?**

○ A: (3,4)
○ B: (-3,-4)
○ C: (-3,4)
○ D: (3,-4)

6. **What is the focus of the ellipse $x^2/16 + y^2/4 = 1$?**

○ A: $(\pm 2\sqrt{3}, 0)$
○ B: $(\pm \sqrt{3}, 0)$.
○ C: $(\pm 2\sqrt{5}, 0)$.
○ D: $(\pm \sqrt{5}, 0)$.

7. **The plane cutting a double cone as shown in the figure below would get a/an?**

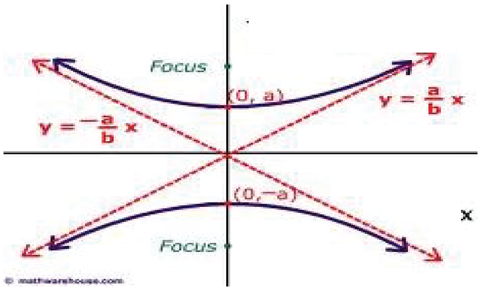


○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

8. **The equation $x^2/a^2 + y^2/b^2 = 1$ represents a verticle ellipse if?**

○ A: $a^2 = b^2$
○ B: $a^2 < b^2$
○ C: $a^2 > b^2$
○ D: None of the above.

9. The equation of the given hyperbola is of form?



○ A: $x^2/a^2 + y^2/b^2 = 1$ ○ B: $x^2/b^2 + y^2/a^2 = 1$

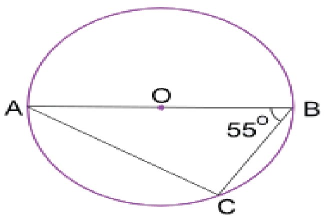
○ C: $x^2/a^2 - y^2/b^2 = 1$ ○ D: $y^2/a^2 - x^2/b^2 = 1$

10. When the cutting of a conic section is parallel to the axis of the cone and intersects both nappes, it represents a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

11. What is angle CAB in the given figure?



○ A: 35° ○ B: 45°

○ C: 55° ○ D: 65°

12. A line $y = mx + c$ intersects a circle $x^2 + y^2 = a^2$. The point of intersection are imaginary if?

○ A: $a^2 (1+m^2) - c^2 > 0$ ○ B: $a^2 (1+m^2) - c^2 = 0$

○ C: $a^2 (1+m^2) - c^2 < 0$ ○ D: Intersection points are never imaginary.

13. If a circle is represented by the equation $x^2 + y^2 + 4x - 6y - 12 = 0$. Then the point (-5,6) is?

○ A: Inside the circle ○ B: Outside the circle.

○ C: On the circle. ○ D: Center of the circle.

14. Circle is a special case of ellipse with eccentricity = ?

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

15. The parametric form of equation (a cos ϴ, b sin ϴ) is for?

○ A: Circle ○ B: Hyperbola

○ C: Ellipse ○ D: Parabola

16. Equation of the directrices of hyperbola $y^2/a^2 - x^2/b^2 = 1$ is given by?

○ A: $x = \pm c/e^2$ ○ B: $x = \pm b/e$

○ C: $y = \pm c/e^2$ ○ D: $y = \pm b/e$

17. If e > 1 then the conic section is a?

○ A: Parabols ○ B: Ellipse

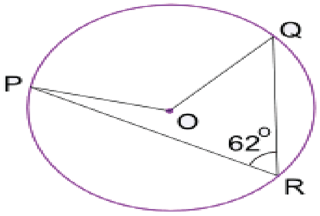
○ C: Hyperbola ○ D: Circle.

18. If a plane cutting one section of a double cone is slightly tilted and not parallel to the generator of the cone, we get a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

19. What is the angle POQ in the given diagram?



○ A: 62° ○ B: 102°

○ C: 124° ○ D: 132°

20. Focal chord perpendicular to the axis of the parabola is called?

○ A: Directrix. ○ B: Tangent Chord

○ C: Latusrectum. ○ D: Vertex.

TEST 2

1. **For a general form of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius is given by**?

○ A: g + f + c ○ B: $\sqrt{g^2+f^2}$

○ C: $\sqrt{g^2+f^2-c}$ ○ D: $\sqrt{g^2+f^2+c}$

What is the eccentricity of the ellipse given by equation $x^2/9 + y^2/4 = 1$?

○ A: 5/3 ○ B: √5/3

○ C: 2/3 ○ D: √2/3

2. **The equations $x = at^2$, $y = at$; $t \in R$ represents?**

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

3. **Intersecting properties of conic sections were discovered by?**

○ A: Pythagoras ○ B: Eudoxus and Georg Cantor

○ C: Euclid ○ D: Apollonius and Pappus

4. **What are the coordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$?**

○ A: (2,-1) ○ B: (2,1)

○ C: (-2,-1) ○ D: (2,0)

5. **What is the focus of the parabola $4x - y^2 = 2y + 13$?**

○ A: (3,-1) ○ B: (3,1)

○ C: (4, 1) ○ D: (4, -1)

6. What are the foci of hyperbola $x^2/9 - y^2/4 = 1$?

○ A: $(\pm\sqrt{5}, 0)$
○ B: $(0, \pm\sqrt{5})$
○ C: $(0, \pm\sqrt{13})$
○ D: $(\pm\sqrt{13}, 0)$

7. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x-a)$ is?

○ A: 90°
○ B: 60°
○ C: 45°
○ D: 30°

8. Equation of a line tangent to ellipse at $x^2/a^2 + y^2/b^2 = 1$ at points (4,10) is?

○ A: $4x/a^2 + 10y/b^2 = 1$
○ B: $10x/a^2 + 4y/b^2 = 1$
○ C: $16x/a^2 + 100y/b^2 = 1$
○ D: $100x/a^2 + 16y/b^2 = 1$

9. The line $y = 2x + c$ is tangent to the ellipse $x^2/16 + y^2/4 = 1$ if c equals?

○ A: $\sqrt{29}$
○ B: $\sqrt{60}$
○ C: $\sqrt{68}$
○ D: $\sqrt{74}$

10. What is the center of the ellipse $x^2 + 4y^2 + 4x - 24y + 24 = 0$?

○ A: (-2,3)
○ B: (-2, -3)
○ C: (2,3)
○ D: (2,-3)

11. Which of the following is not an equation of a circle?

○ A: $x^2 + y^2 - x + 98y + 11 = 4$
○ B: $x^2 + y^2 + 18x + 98y + 11 = 0$
○ C: $5x^2 + 5y^2 + 14x + 12y - 10 = 0$
○ D: $x^2 + 3y^2 + 10x - 9y + 11 = 0$

12. Latusrectum of the parabola $y^2 = -4ax$ is?

○ A: $x = a$
○ B: $x = -a$
○ C: $y = a$
○ D: $y = -a$

13. The equations $x = a \cos \theta$, $y = b \sin \theta$, $0 \leq \theta < 2\pi$, $a \neq b$, represents?

○ A: A circle
○ B: A parabola
○ C: A hyperbola
○ D: An ellipse

14. The vertex of the parabola $(y - a)^2 = 4a (x - a)$ is?

○ A: (0,a)
○ B: (a,0)
○ C: (0,0)
○ D: None of the above.

15. A second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola if?

○ A: $h^2 - ab = 0$
○ B: $h^2 - ab > 0$
○ C: $h^2 - ab < 0$
○ D: None of the above.

16. What is the length of the major axis for the ellipse $x^2/16 + y^2/4 = 1$?

○ A: 2
○ B: 4
○ C: 6
○ D: 8

17. The equation $y = mx + a/m$ is tangent to $y^2 = 4ax$ for m = ?

○ A: 0
○ B: 1
○ C: All positive values
○ D: All nonzero values

18. What is the center of a circle represented by a general form $5x^2 + 5y^2 + 24x + 36y + 10 = 0$?

○ A: (-12/5 , -18/5)
○ B: (12/5 , 18/5)
○ C: (-9/5 , -7/5)
○ D: (9/5 , 7/5)

19. The interior of a satellite dish has diameter 12 ft and 2 ft deep as shown in the figure below. What is the distance from the center of the dish to the focus?

○ A: 4.5 ft
○ B: 5.5 ft
○ C: 6.0 ft.
○ D: 6.2 ft

TEST 3

1. Minimum number of non-collinear points on a circle required to form an equation of a circle are?

○ A: 2
○ B: 3
○ C: 4
○ D: 5

2. The foci of an ellipse are (0, ± 1) and minor axis is of unit length. The equation of the ellipse is ?

○ A: $2x^2 + 4y^2 = 5$
○ B: $4x^2 + 2y^2 = 5$
○ C: $15x^2 + 6y^2 = 1$
○ D: $20x^2 + 4y^2 = 5$

3. The sum of distances of any point on the ellipse $3x^2 + 4y^2 = 24$ from its foci is?

○ A: 8 units
○ B: $2\sqrt{2}$ units
○ C: $4\sqrt{2}$ units
○ D: 7 units

4. The line $y + 2x - 5 = 0$ with respect to the circle $x^2 + y^2 + 2x - 9 = 0$?

○ A: Cuts the circle at two distinct points.
○ B: Tangent to the circle.
○ C: Do not touch the circle.
○ D: None of the above.

5. If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then a is equal to?

○ A: 15/16
○ B: 9/7
○ C: 5/4
○ D: 2/3

6. What is the equation of tangent to the circle $x^2 + y^2 + 5/3\,x - 13/3\,y + 2/3 = 0$ at (1, 10/3)?

○ A: $21x - 33y + 89 = 0$
○ B: $33x + 21y + 157 = 0$
○ C: $8x + 46y - 22 = 0$
○ D: $3x + 19y + 27 = 0$

7. What is the equation of a circle with diameter between two points A (2,3) and B (4,6)?

○ A: $x^2 + y^2 + 3x - 9y - 23 = 0$
○ B: $x^2 + y^2 - 9x - 2y + 11 = 0$
○ C: $x^2 + y^2 - 6x - 9y + 26 = 0$
○ D: Cannot be determined from the given information.

8. If e_1 and e_2 are eccentricities of the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$ and $x^2/b^2 - y^2/a^2 = 1$ then?

○ A: $e_1 = e_2$
○ B: $e_1 * e_2 = 1$
○ C: $e_1 + e_2 = 0$
○ D: $1/e_1^2 + 1/e_2^2 = 1$

9. The line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$ if c equals?

○ A: 2
○ B: 1/2
○ C: 0
○ D: -1/2

10. The equation of the circle whose diameter is the latusrectum of the parabola $x^2 = 4y$ is?

○ A: $x^2 + (y-1)^2 = 4$ ○ B: $(x - 2)^2 + (y - 1)^2 = 4$

○ C: $y^2 + (x-1)^2 = 4$ ○ D: $y^2 + (x-1)^2 = 2$

11. Line $y = 2c$ is a tangent to the parabola $y^2 = 4ax$ if c is equal to?

○ A: 0 ○ B: 4

○ C: 2a ○ D: None of the above.

12. The line $5y + 12x - 39 = 0$ to the circle $x^2 + y^2 = 9$?

○ A: Cuts the circle in two distinct points.

○ B: Do not touch the circle ○ C: Is tangent to circle

○ D: Cuts the circle at two imaginary points

13. What is the equation of a circle passing through non collinear points A(5, 8) and B(-2,9)?

○ A: $x^2 + y^2 + 4x - 12y - 20 = 0$ ○ B: $x^2 + y^2 + 4x - 9y - 15 = 0$

○ C: $x^2 + y^2 + 9x - 7y + 3 = 0$ ○ D: Equation cannot be formed from the given information.

14. What is the focus of the ellipse given by the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$?

○ A: $(1, \pm\sqrt{5})$ ○ B: $(1,-1\pm\sqrt{5})$

○ C: $(1,1\pm\sqrt{5})$ ○ D: $(1\pm\sqrt{5}, -1)$

15. $x = \dfrac{e^t + e^{-t}}{2},\ y = \dfrac{e^t - e^{-t}}{2};\ t \in R$ represents

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

16. The line $y = mx + 1$ is tangent to parabola $y^2 = 4x$ if m = ?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

17. Slope of the normal at point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is?

○ A: 1/t ○ B: t

○ C: -t ○ D: -1/t

18. What is the equation of the asymptotes for the given hyperbola?

$4x^2 - 9y^2 - 32x - 18y + 19 = 0$.

○ A: $(y + 1) = \pm 2/3\ (x - 4)$ ○ B: $(y + 1) = \pm 4/9\ (x - 4)$

○ C: $(y - 1) = \pm 2/3\ (x + 4)$ ○ D: $(y - 1) = \pm 4/9\ (x + 4)$

19. The general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a hyperbola if?

○ A: $h^2 - ab < 0$ ○ B: $h^2 - ab = 0$

○ C: $h^2 - ab > 0$ ○ D: None of the above.

20. The point on the curve $y^2 = x$, where the tangent line makes an angle of 45° with the x-axis is?

○ A: (3/4,1/2) ○ B: (1/4,1/2)

○ C: (1/4,3/2) ○ D: (1,2)

TEST 4

1. Parametric form of equation for a cricle is?

○ A: (a sec Θ, b tan Θ)
○ B: (r cos Θ, r sin Θ)
○ C: (a cos Θ, b sin Θ)
○ D: $(at^2, 2at)$

2. What is the vertex of the parabola $y = -2x^2 + 4x + 1$?

○ A: (2,1)
○ B: (-2,-1)
○ C: (-1,-3)
○ D: (1,3)

3. If one foci of the ellipse is at (-3,0) and the ellipse is centered around the origin. What is the distance between the two foci of the ellipse?

○ A: Cannot be determined.
○ B: 9
○ C: 6
○ D: 3

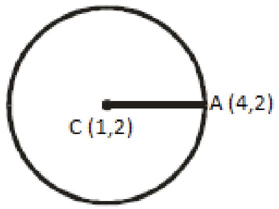
4. What is the focus of the parabola $y^2 - x - 2y + 2 = 0$?

○ A: (3/4 , 1)
○ B: (1/4 , 0)
○ C: (1/4 , 1)
○ D: (5/4 , 1)

5. Axis of the parabola $9y^2 - 16x - 12y - 57 = 0$ is?

○ A: 2/3
○ B: 3/2
○ C: -2/3
○ D: -3/2

6. What is the equation of the circle given in the figure below?



○ A: $(x - 1)^2 + (y - 2)^2 = 16$
○ B: $(x + 1)^2 + (y + 2)^2 = 9$
○ C: $(x - 1)^2 + (y - 2)^2 = 9$
○ D: $(x - 1)^2 + (y + 2)^2 = 16$

7. Parametric form of equation for a parabola is?

○ A: (r cos Θ, r sin Θ)
○ B: $(at^2, 2at)$
○ C: (a cos Θ, b sin Θ)
○ D: (a sec Θ, b tan Θ)

8. The equation of the parabola with focus at (0, a) and directrix y + a = 0 is (a > 0) ?

○ A: $x^2 = 4ay$
○ B: $x^2 = -4ay$
○ C: $y^2 = 4ax$
○ D: $y^2 = -4ax$

9. The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is?

○ A: (4,4)
○ B: (2,2)
○ C: $(\sqrt{2}, 2)$
○ D: $(2\sqrt{2}, 2)$

10. For a general equation $Ax^2 + By^2 + Gx + Fy + C = 0$, if A is not equal to B and both have opposite signs then it represents?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

11. The line $y = mx + c$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ if?

○ A: $c = a/m$
○ B: $c^2 = a^2 m^2 + b^2$
○ C: $c^2 = a^2 m^2 - b^2$
○ D: None of the above.

12. If a is the major axis, b is the minor axis and e is the eccentricity of an ellipse. Its directrices are given by?

○ A: $\pm c/e$
○ B: $\pm b/e$
○ C: $\pm a/e$
○ D: $\pm b/e^2$

13. The equation $(y - y_1)(x_1 + g) = (x - x_1)(y_1 + f)$ represents?

○ A: Tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ B: Normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ C: Chord of a circle $x^2 + y^2 + 2gx + 2fy + c = 0$ through point (x_1 , y_1)
○ D: None of the above.

14. If the length of major axis of ellipse is 2a and length of minor axis is 2b. Then the length if latusrectum is approximately?

○ A: $4b/a$
○ B: $4a^2/b$
○ C: $2b^2/a$
○ D: $a/2b$

15. When the cutting of a conic section is perpendicular to the axis of the cone, it represents a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

16. What is the length of the tangent from point (-5, 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$?

○ A: $\sqrt{29}$
○ B: $\sqrt{67}$
○ C: $\sqrt{102}$
○ D: $\sqrt{133}$

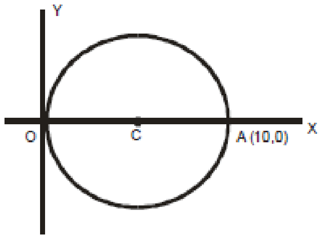
17. From a point P outside a circle, how many tangents can be drawn?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

18. What is the radius of a circle represented by the equation $x^2 + y^2+12x - 10y = 0$?

○ A: $\sqrt{61}$
○ B: $\sqrt{55}$
○ C: $\sqrt{52}$
○ D: $\sqrt{47}$

19. Equation of the circle given in the figure below is?



○ A: $x^2 + y^2 = 25$
○ B: $(x-5)^2 + y^2 = 25$
○ C: $(x + 5)^2 + y^2 = 25$
○ D: $(x + 5)^2 + y^2 = 10$

20. Find the equation of an ellipse with centre (0,0), focus (0,-3) and one vertes at (0,4)?

○ A: $x^2/16 + y^2/7 = 1$
○ B: $x^2/7 + y^2/16 = 1$
○ C: $x^2/\sqrt{7} + y^2/4 = 1$
○ D: $x^2/7 + y^2/4 = 1$

Vectors

TEST 1

1. **What are the direction cosines of unit vector**

$$\hat{\underline{v}} = \left[\frac{6}{\sqrt{41}}, \frac{-2}{\sqrt{41}}, \frac{1}{\sqrt{41}}\right]$$

○ A: 0, 0, 0
○ B: -6/√41 , +2/√41, -1/√41
○ C: 6/√41 , -2/√41, 1/√41
○ D: None of the above.

2. **If volume of a parallelepiped with a ,b , c as co-terminus edges is 36 the volume of the tetrahedron with the same edges is?**

○ A: 13
○ B: 12
○ C: 6
○ D: 3

3. **Value of [i, i , k] is?**

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

4. **The value of 2*i* x 4*k* =?**

○ A: 0
○ B: 8k
○ C: -8j
○ D: 8j

5. **The volume of the parallelepiped with *u* , *v* and *w* as its coterminus edges is?**

○ A: u.(v x w)
○ B: 1/2 * u.(v x w)
○ C: 1/6 * u.(v x w)
○ D: u x (v x w)

6. **If ā is a unit vector. Then the value of ā.ƃ is? Assume that the two vectos are not perpendicular to each other.**

○ A: 0
○ B: 1
○ C: ā cos θ
○ D: ƃ cos θ

7. **Which of the following statement is true?**

○ A: Only dot product possesses distributive property
○ B: Only cross product possesses distributive property
○ C: Both dot and cross product possess distributive property
○ D: Neither dot nor cross product possess distributive property

8. **The value of (2*j x i*) - 3*k* = ?**

○ A: -5k
○ B: 5k
○ C: k
○ D: -k

9. **Find the magnitude of vector v = -3i + 4j ?**

○ A: 2
○ B: 3
○ C: 4
○ D: 5

10. **If terminal point of a vector coincides with its origin point then it is called?**

○ A: Unit Vector.
○ B: Null Vector.
○ C: Equity Vector.
○ D: Negative Vector.

11. If ā = [1,-3] and ƃ = [2,5] ; 4ā + 2ƃ = ?

○ A: [3,2]
○ B: [8,2]
○ C: [-8,2]
○ D: [8,-2]

12. If ā, ƃ and c are three vectors representing three edges of a parallelepiped. Its volume is given by?

○ A: ā x ƃ x c
○ B: ā . ƃ . c
○ C: ā . (ƃ x c) / 2
○ D: ā . (ƃ x c)

13. If three vectors are coplanar then their scalar triple product is?

○ A: 0
○ B: 1
○ C: -1
○ D: Equal to vector triple product.

14. i.j = ?

○ A: 0
○ B: 1
○ C: -1
○ D: k

15. If ā = i - k and ƃ = j + k then the projection of ā along ƃ is?

○ A: -1/√2
○ B: 1/√2
○ C: 1
○ D: -1

16. If k is a scalar ā x kƃ = ?

○ A: kā x ƃ
○ B: k (ā x ƃ)
○ C: kā x kƃ
○ D: Both A and B.

17. If ā = [2,1,3] and ƃ = [-1,4,0]. What is the magnitude of ā - 2ƃ?

○ A: 16
○ B: √74
○ C: √93
○ D: 36

18. What is the unit vector for v = 3i - j +2k?

○ A: [3/√14 , 1/√14, 2/√14]
○ B: [5/√37 , -2/√37, 7/√37]
○ C: [1/√37 , 8/√37, -3/√37]
○ D: [3/√14 , -1/√14, 2/√14]

19. The position vector of a point P(x, y, z) is denoted by?

○ A: $\overrightarrow{PQ}$
○ B: $\overrightarrow{P}$
○ C: $\overrightarrow{OP}$
○ D: All of the above.

20. k.k =?

○ A: 0
○ B: 1
○ C: -1
○ D: j

TEST 2

1. **If AB = i + j + k, AC = -4k and AD = i +2j - 8k then the volume of tetrahedron ABCD formed by the three vectors is?**

   ○ A: 1 ○ B: 2/3

   ○ C: 2 ○ D: 4

2. **What is the value of α such that αi + j , i + j + 3k and 2i + j - 2k are coplanar?**

   ○ A: 1/3 ○ B: 7/4

   ○ C: 9/5 ○ D: 8/5

3. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors such that $|\vec{b}| = |\vec{c}|$, then $\left[(\vec{a}+\vec{b}) \times (\vec{a}+\vec{c})\right] \times (\vec{b} \times \vec{c}) =$

   ○ A: 1 ○ B: -1

   ○ C: 0 ○ D: 2

4. **(2j x 3i).k = ?**

   ○ A: 0 ○ B: 7

   ○ C: 6 ○ D: -6

5. **What is the vector perpendicular to both vectors $\bar{a}$ = 2i - j + k and $\bar{b}$ = 4i + 2j - k?**

   ○ A: -i + 6j + 8k ○ B: -2i + 3j + 9k

   ○ C: 3i + 1j + 7k ○ D: 5i - 3j + k

6. **If $\bar{a}$ = 2i - 4j + 5k and $\bar{b}$ = 4i + xj - 4k. What is the value of x if $\bar{a}$ and $\bar{b}$ are perpendicular to each other?**

   ○ A: -1 ○ B: -2

   ○ C: -3 ○ D: -4

7. **Which of these vectors are parallel?**

   a = 2i + 3j + k, b = 4i + 6j + 2k, c = 6i + 9j + 3k

   ○ A: a and b ○ B: a and c

   ○ C: a, b and c all are parallel to each other.

   ○ D: None of them is parallel.

8. **Unit vector perpendicular to i - j and i + j is?**

   ○ A: k ○ B: -k

   ○ C: (i - j) / 2 ○ D: (i + j) / √2

9. **Which of the following expressions is meaningful?**

   ○ A: u.(v x w) ○ B: (u.v) .w

   ○ C: (u.v) . w ○ D: None of the above.

10. **Zero vector is?**

    ○ A: Parallel to every vector. ○ B: Perpendicular to every vector.

    ○ C: Both parallel and perpendicular to every vector.

    ○ D: Is inverse of every vector.

TEST 3

1. **The point which divides the line joining (2, 4, 5) and (-3, 5, - 4) in the ratio 2 : 3, lies on?**

○ A: XY plane ○ B: YZ plane

○ C: XZ plane ○ D: None of the above.

2. **If result of two forces ā of magnitude (P) and b̄ of magnitude (Q) isperpendicular to ā and has magnitude P. Then the magnitude of b̄ is?**

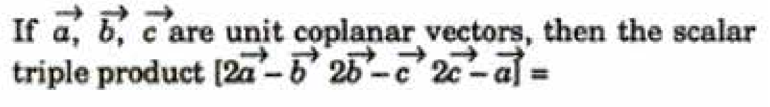
○ A: P ○ B: P√2

○ C: P√3 ○ D: 2P√3

3. **If ā x b̄ = ā x ē then which of the following is true?**

○ A: ā, b̄ and ē are coplanar. ○ B: ā, b̄ and ē are orthogonal

○ C: b̄ = ē ○ D: ā is parallel to b̄

4. 

If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}\ \ 2\vec{b}-\vec{c}\ \ 2\vec{c}-\vec{a}] =$

○ A: 0 ○ B: 1

○ C: √2 ○ D: √3

5. **If ā, b̄, ē, ō are the vertices of a square then?**

○ A: b̄ - ā = ē – b̄ ○ B: ā + b̄ + ē = 0

○ C: (ē - ā) . (ō - b̄) = 0 ○ D: None of the above.

6. **If the vectors a, b and c be the vectors representing the sides AB, BC and CA respectively of a triangle ABC, then?**

○ A: a.(bxc) = 0 ○ B: (a.b) x c = (a.c) x b

○ C: |a x b| = |a x c| = |b x c| ○ D: |a x b| + |b x c| + |c x a| = 0

Position vector a = 2i - 3j and b = 3i + 2j. What are the coordinates of position vector that divides the line between a and b in ration 4:3?

○ A: 11/7 i + 8/7 j ○ B: 1/7 i - 5/7 j

○ C: 18/7 i - 1/7 j ○ D: 23/7 i + 3/7 j

7. **The points (5, 2, 4), (6, −1, 2) and (8, −7, k) are collinear if k is equal to?**

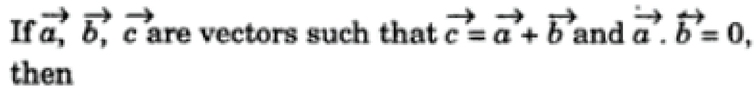
○ A: 3 ○ B: 2

○ C: -1 ○ D: -2

8. **If A (-2,-3), B (1,4), C(0,-5) are three vertices of parallelogram ABCD. What are the coordinates of D if AB is parallel to DC?**

○ A: (3,14) ○ B: (-4,11)

○ C: (-3, -12) ○ D: (-4, 9)

9. 

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{c} = \vec{a} + \vec{b}$ and $\vec{a} . \vec{b} = 0$, then

○ A: $a^2 + b^2 + c^2 = 0$ ○ B: $a^2 - b^2 = c^2$

○ C: $a^2 + b^2 = 0$ ○ D: $c^2 = a^2 + b^2$

10. **The point having position vectors $2\hat{i} + 3\hat{j} + 4\hat{k}$, $3\hat{i} + 4\hat{j} + 2\hat{k}$, $4\hat{i} + 2\hat{j} + 3\hat{k}$ are the vertices of a triangle. The triangle is?**

○ A: Right angled. ○ B: Equilateral.

○ C: Isosceles. ○ D: None of the above.

11. **The points with position vectors $14\hat{i} - 13\hat{j}$, $12\hat{i} - 5\hat{j}$ and $a\hat{i} + 11\hat{j}$ are collinear if a equals**

○ A: 8 ○ B: 13

○ C: -5 ○ D: -9

12. **Angles α , β and δ are direction angles of a single vector only if?**

○ A: $\cos^2 \alpha = \cos^2 \beta = \cos^2 \delta$ ○ B: $\cos^2 \alpha = \cos^2 \beta + \cos^2 \delta$

○ C: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 0$ ○ D: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 1$

13. **Let $\vec{a} = \hat{i} - \hat{k}$, $\vec{b} = x\hat{i} + \hat{j} + (1 - x)\hat{k}$ and $\vec{c} = y\hat{i} + x\hat{j} + (1 + x - y)\hat{k}$, then $[\vec{a}\ \vec{b}\ \vec{c}]$ depends on**

○ A: Only x ○ B: Only y

○ C: Both x and y ○ D: Neither x nor y

TEST 4

1. **Unit vector in the direction of vector v = [-3,-4] is?**

○ A: -3/5 i - 4/5 j ○ B: -3/5 i + 4/5 j

○ C: 3/5 i - 4/5 j ○ D: 3/5 i + 4/5 j

2. **Let a = 2i + j + k, a vector c perpendicular to a is?**

○ A: $\frac{1}{\sqrt{2}}(-j + k)$ ○ B: $\frac{1}{\sqrt{3}}(i + j - k)$

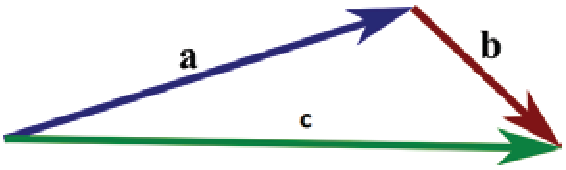
○ C: $\frac{1}{\sqrt{5}}(-i - j - k)$ ○ D: $\frac{1}{\sqrt{2}}(i - 2j)$

3. **The area (in square units) of the parallelogram whose diagonals are $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} + 4\hat{k}$**

○ A: √7 ○ B: √11

○ C: √14 ○ D: Cannot be determined from the given information.

4. **In the figure below vector b is given by?**



○ A: c + a ○ B: c - a

○ C: a – c ○ D: None of the above.

5. Let $\alpha = (x + 4y)\vec{a} + (2x + y + 1)\vec{b}$ and $\beta = (y - 2x + 2)\vec{a} + (2x - 3y - 1)\vec{b}$, where $\vec{a}$ and $\vec{b}$ are non-zero, non-collinear. If $3\alpha = 2\beta$, then

○ A: x= 1, y = -2

○ B: x= -2, y = -1

○ C: x= 2, y = 2

○ D: x= 2, y = -1

6. For two position vectors ā and ƃ. The coordinates of position vector dividing the line between ā and ƃ in ration 1 : 1 would be?

○ A: (ā - ƃ) / 2

○ B: (ā + ƃ) / 2

○ C: (ā + ƃ) / 4

○ D: (ā - ƃ) / 4

7. If magnitude of vector ā = 25 the ā.ā = ?

○ A: 5

○ B: 25

○ C: 625

○ D: 0

8. Which of the following is not a defined quantity?

○ A: i.i / k.k

○ B: i.j / j.j

○ C: i.i / i.k

○ D: All of them are defined quantities.

9. If ā.i = 0 and ā.j = 0 and ā.k = 0 then value of ā is?

○ A: i + j + k

○ B: [-1,-1,-1]

○ C: Unit vector.

○ D: Null vector.

10. A particle acted upon by forces $3\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}$ is displaced from a point P to a point Q whose respective position vectors are $2\hat{i} - \hat{j} - 3\hat{k}$ and $4\hat{i} - 3\hat{j} + 7\hat{k}$. The work done by the force is

○ A: 16

○ B: 24

○ C: 36

○ D: 38

11. Value of [k, i, j] is?

○ A: 0

○ B: 1

○ C: -1

○ D: √-1

12. Area of a parallelogram which has vectors i and i + j as the adjecent sides is?

○ A: ½

○ B: 1

○ C: 2

○ D: √2

13. If ā x ƃ = i + 2j + 2k then ƃ x ā= ?

○ A: 1/3i + 2/3j + 2/3k

○ B: -i - 2j - 2k

○ C: 2i + 2j + k

○ D: None of the above.

14. If ā = ƃ then the value of triple scalar product ā.(ƃ x c) is?

○ A: 0

○ B: 1

○ C: -1

○ D: ā.ƃ

15. Which of the following quantities is undefined?

○ A: (i.i) / (i x j)
○ B: (i.j) / (j.j)
○ C: (j x k) / (i x j)
○ D: (i x k) / (j x j)

16. Which of the following statement is true?

If a.b = 0 a and b are parallel, If a x b = 0 then either a or b must be zero,

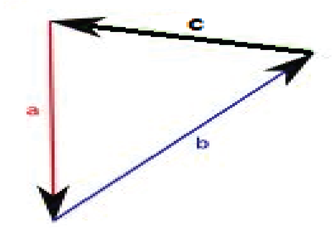
If a. (b x c) = 0 then a, b and c are coplanar.

○ A: iii only
○ B: i and ii only
○ C: ii and iii only
○ D: i, ii and iii

17. If $u = 2\hat{i} - 4\hat{j} + 5\hat{k}$ and $v = 4\hat{i} - 3\hat{j} - 4\hat{k}$ then u and v are?

○ A: Parallel
○ B: Perpendicular
○ C: Equal
○ D: Opposite

18. Which of the following is true about the vector diagram given below?



○ A: c = a + b
○ B: c = a - b
○ C: a + b = 0
○ D: a + b + c = 0

19. Which of the following position vectors have same magnitude?

a= [3,-4,2], b = [-3, 4, -2], c = [2, 4, 3]

○ A: a and b
○ B: a and c
○ C: All have same magnitude.
○ D: None of the has same magnitude.

20. In a parallelogram, the cross product of two adjacent vectors AB = i + 2j - 2j and BC = -2i + 2j + k is : 6i + 3j + 6k. The area of the parallelogram is?

○ A: 4.5
○ B: 9
○ C: 15
○ D: 18

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Number Systems

TEST 1

1. **i^{13} = ?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

2. **If -1 + √-3 = r $e^{i\Theta}$ then Θ equals to?**

○ A: 2 pi / 3
○ B: -2 pi / 3
○ C: pi / 3
○ D: - pi / 3

3. **Square roots of -1 are?**

○ A: i , -I
○ B: i
○ C: 1
○ D: -i

4. $\left(\frac{2i}{1+i}\right)^2$ **is equal to?**

○ A: I
○ B: 2i
○ C: 1-I
○ D: 1-2i

5. **Conjugate of 4 + 5i is?**

○ A: -4 + 5i
○ B: 4 - 5i
○ C: $4^2 + (5i)^2$
○ D: 5 + 4i

6. **$(1 + i)^2$ = ?**

○ A: 2i
○ B: -2i
○ C: I
○ D: -i

7. **The value of** $\frac{i^{4n+1} - i^{4n-1}}{2}$ **is equal to?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

8. **If y and g are two complex numbers then** $\overline{y+g} = ?$

○ A: $\bar{Y} . \bar{g}$
○ B: $\bar{Y} / \bar{g}$
○ C: $\bar{Y} + \bar{g}$
○ D: $\bar{Y} - \bar{g}$

9. **(3 + 2i) + (1 + i) = ?**

○ A: 4 + 2i
○ B: 4 + 3i
○ C: 4 - 2i
○ D: 4 - 3i

10. **The complex number i + √3 in polar form can be written as?**

○ A: $\frac{1}{\sqrt{2}}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ B: $2\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$
○ C: $\frac{1}{2}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ D: $4\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$

11. **If $g = 2 + i\sqrt{3}$ then $g.\bar{g}$ = ?**

○ A: $2 - i\sqrt{3}$
○ B: 13
○ C: 8
○ D: 7

12. **The moduli of complex number $1 - i\sqrt{3}$ = ?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

13. **4 * (1 - 3i) = ?**

○ A: 4 - 3i
○ B: 40
○ C: 4 - 12i
○ D: None of the above.

14. **Multiplicative identity for complex numbers is?**

○ A: (0 , 0)
○ B: (0 , 1)
○ C: (1 ,1)
○ D: (1 , 0)

15. **If z is a complex number then | z1 . z2 | = ?**

○ A: $\sqrt{(z1)^2 + (z2)^2}$
○ B: $\sqrt{(z1)^2 - (z2)^2}$
○ C: | z1 | x | z2 |
○ D: | z1 | / | z2 |

16. **(5, 0) * (2 , 0) = ?**

○ A: 10
○ B: 10 + i
○ C: 10 + 2i
○ D: 10 + 5i

17. **If z = 1 + i then multiplicative inverse of z^2 is?**

○ A: 1 – I
○ B: i / 2
○ C: - i / 2
○ D: 2i

18. **What is the product of (1 + i) and (1 + 2i)?**

○ A: -2 + I
○ B: 2 + i
○ C: -1 + 3i
○ D: 1 + 3i

19. **The value of | -5i | is?**

○ A: 5
○ B: 10
○ C: 20
○ D: 25

20. $\left(\frac{1-i}{1+i}\right)^{20}$ **is equal to?**

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: -1

TEST 2

1. **The complex number (1 + 2i) / (1 - i) lies in?**

○ A: I quadrant ○ B: II quadrant

○ C: III quadrant ○ D: IV quadrant.

2. **A complex number added to its additive inverse would give?**

○ A: Multiplicative identity ○ B: Additive identity

○ C: Additive inverse. ○ D: Multiplicative inverse.

3. **If y is a complex number then | -y | = ?**

○ A: | y | ○ B: $|\bar{y}|$

○ C: $|-\bar{y}|$ ○ D: All of the above.

4. **If z is a complex number such that z + 1/z = 1 then the value of $z^{99} + 1/z^{99}$ is ?**

○ A: 1 ○ B: -1

○ C: 2 ○ D: -2

5. Express in terms of *i* the sum of $\sqrt{-81}$ and $2\sqrt{-25}$.

○ A: 9i ○ B: -9i

○ C: 23i ○ D: 19i

6. **Even integers (including zero) are closed under which of the following operation?**

○ A: Addition ○ B: Subtraction

○ C: Multiplication ○ D: All of the above.

7. $\left[i^{67} + \frac{1}{i^{125}}\right] = ?$

○ A: 0 ○ B: 2

○ C: 2i ○ D: -2i

8. **If F = $x^3 + x^2 + 2x + 6$ then F(i) = ?**

○ A: 3 + I ○ B: 5 + i

○ C: 3 – I ○ D: 2 - 5i

9. **Find multiplicative inverse of √2 - i√5 ?**

○ A: -(√2 / 7) + (√5 / 7)I ○ B: (√2 / 7) - (√5 / 7)i

○ C: (√2 / 7) + (√5 / 7)I ○ D: -(√2 / 7) - (√5 / 7)i

10. **Square roots of number $(-3)^2$ are?**

○ A: 3i , -3i ○ B: 3

○ C: -3i ○ D: 3, -3

11. If y is a complex number then $y \cdot \bar{y} = ?$

○ A: $\bar{y}$
○ B: y
○ C: $|-y|^2$
○ D: None of the above.

12. The modulus of the complex number

$$\frac{(1-i\sqrt{3})(\cos\theta + i\sin\theta)}{2(1-i)(\cos\theta - i\sin\theta)} \text{ is}$$

○ A: 1/√2
○ B: 1/2√2
○ C: 1/√3
○ D: None of these.

13. $(\cos \Theta + i \sin \Theta)^n = ?$

○ A: $(\cos \Theta^n + i \sin \Theta^n)$
○ B: cos nΘ - i sin nΘ
○ C: cos nΘ + i sin nΘ
○ D: ncos Θ + i n sin Θ

14. $i^5 + i^6 = ?$

○ A: 1 + I
○ B: -1 + i
○ C: i
○ D: 2I

15. $(-1)^{-21/2} = ?$

○ A: 0
○ B: 1
○ C: I
○ D: -i

16. Multiplicative inverse of the complex number 1 + i is?

○ A: 1 – I
○ B: 1/2 + 1/2i
○ C: 1/2 - 1/2i
○ D: 1/√2 - i 1/√2

17. $\frac{2+i}{2-i} - \frac{2-i}{2+i} =$ **?**

○ A: i / 5
○ B: i / 3
○ C: 8i / 5
○ D: 7i / 5

18. The conjugate complex of number $(2 - i) / (1 - 2i)^2$ is equal to?

○ A: 2 / 25 + i 11 / 25
○ B: 2 / 25 - i 11 / 25
○ C: - 2 / 25 + i 11 / 25
○ D: - 2 / 25 - i 11 / 25

19. If $8iz^3 + 12z^2 - 18z + 27i = 0$, then?

○ A: |z| = 3/2
○ B: |z| = 2/3
○ C: |z| = 1
○ D: |z| = 1/3

20. (8 , 9) * (5, -6) =?

○ A: (14, -1)
○ B: (94, -3)
○ C: (48, -2)
○ D: None of the above.

TEST 3

1. **The triangle formed by points 1 , $(1 + i) / \sqrt{2}$ and i in the argand diagram is?**

○ A: Scalene
○ B: Equilateral
○ C: Isoceles
○ D: Right angled

2. **The smallest integer n for which** $\left(\frac{1+i}{1-i}\right)^n = 1$ **is?**

○ A: 4
○ B: 8
○ C: 12
○ D: 16

3. $i^{88} - i^{22} = ?$

○ A: I
○ B: -i
○ C: 1
○ D: 2

4. **If** $a = | z_1 | - | z_2 |$; $b = | z_1 + z_2 |$ **and** $c = | z_1 | + | z_2 |$ **then which of the following is true?**

○ A: $c \le b \le a$
○ B: $a \le c \le b$
○ C: $b \le a \le c$
○ D: None of the above.

5. **if** $(\sqrt{3} + i)^{100} = 2^{99} (a + ib)$**, then b is equal to ?**

○ A: $\sqrt{3}$
○ B: $\sqrt{2}$
○ C: 1
○ D: None of the above.

6. **Number of solutions for the equation** $z^2 + \bar{z} = 0$ **is?**

○ A: One
○ B: Two
○ C: Three
○ D: Four

7. If *s* and *t* are different integers and $\sqrt{st} = 8$, which of the following could *not* be a value of $s + t$?

○ A: 16
○ B: 20
○ C: 34
○ D: 65

8. **The modulus of** $\sqrt{2i} - \sqrt{-2i}$ **is?**

○ A: 2
○ B: $\sqrt{2}$
○ C: 0
○ D: $2\sqrt{2}$

9. If x = $\sqrt{-1 - \sqrt{-1 - \sqrt{-1 - \sqrt{-1}}}}$ ... then x is equal to

○ A: w
○ B: w^2
○ C: w or w^2
○ D: 0

10. **The number of solutions for the equation** $z^2 + |z|^2 = 0$ **are? (z is a complex number)**

○ A: One
○ B: Two
○ C: Three
○ D: Infinite

11. The smallest positive number n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is?

○ A: 12
○ B: 8
○ C: 4
○ D: 2

12. For positive integers $(1 - i)^n \left(1 - \frac{1}{i}\right)^n$ equals to?

○ A: 0
○ B: $2i^n$
○ C: 2^n
○ D: 4^n

13. The complex numbers sin x + i cos 2x and cos x - i sin 2x are conjugate to each other for ?

○ A: x = n * pi
○ B: x = (n + 1/2) * pi
○ C: x = 0
○ D: No value of x.

14. Which of the following numbers lie on the imaginary axis of the Argand diagram?

○ A: 8 + 3i
○ B: 0 + 3i
○ C: 8 + 0i
○ D: None of the above.

15. Cube roots of unity?

○ A: Are collinear
○ B: Lie on the circle of radius √3
○ C: Form an equilateral triangle.
○ D: None of the above.

16. Which of the following is true about complex numbers?

○ A: They do not have a multiplicative inverse.
○ B: They don’t have an additive inverse.
○ C: They always lie on the imaginary axis of the Argand diagram.
○ D: They don’t satisfy the order of axioms.

17. Sum of three consecutive odd numbers is always divisible by?

○ A: 2
○ B: 3
○ C: 4
○ D: 6

18. $(a - ib)^3$ = ?

○ A: $a^3 - i(3a^2b - b^3)$
○ B: $a^3 - 3ab^2 - i(3a^3 - b^3)$
○ C: $a^3 + 3ab^2 - i(3a^2b - b^3)$
○ D: $a^3 - 3ab^2 - i(3a^2b - b^3)$

19. If $p^2 - 2pq + q^2 = c$ where p and q are positive integers and p is even and q is odd which of the following is true?

○ A: c is even and a perfect square.
○ B: c is odd and a perfect square.
○ C: c is even and not a perfect square.
○ D: c is odd and not a perfect square.

20. **If $\left[\dfrac{(\sqrt{3}/2) + i\,(1/2)}{(\sqrt{3}/2) - i\,(1/2)}\right]^{120} = a + i\,b$, then**

○ A: a = cos 20° and b = - sin 20°
○ B: a = cos 20° and b = sin 20°
○ C: a = 0 and b = 1
○ D: a = 1 and b = 0

TEST 4

1. $\left|(1+i)\left(\frac{2+i}{3+i}\right)\right|$ **is equal to?**

○ A: -1/2
○ B: 1/2
○ C: 1
○ D: -1

2. **The value of $(-i)^{1/3}$ is ?**

○ A: -I
○ B: i
○ C: 1
○ D: None of the above.

3. **Which of the following is an irrational number?**

○ A: $\sqrt[3]{-8}$
○ B: $\sqrt{\frac{32}{50}}$
○ C: $5 / \sqrt{5}$
○ D: All of the above.

4. **If $(x + iy)(p + iq) = (x^2 + y^2)i$ then?**

○ A: $p = x, q = y$
○ B: $p = x^2, q = y^2$
○ C: $q = x, p = y$
○ D: None of the above.

5. If $\odot$ is an operation on positive real numbers, for which of the following definitions of $\odot$ is $r \odot s = s \odot r$ (commutative property)?

○ A: $r \,\Theta\, s = r - s$
○ B: $r \,\Theta\, s = r / s$
○ C: $r \,\Theta\, s = r^2 s$
○ D: $r \,\Theta\, s = (r + s) / (rs)$

6. **The complex number $1 + i\sqrt{3}$ in polar form is equal to?**

○ A: $2 \cos 60^\circ - i\, 2 \sin 60^\circ$
○ B: $4 \cos 60^\circ + i\, 4 \sin 60^\circ$
○ C: $4 \cos 60^\circ - i\, 4 \sin 60^\circ$
○ D: $2 \cos 60^\circ + i\, 2 \sin 60^\circ$

7. **(2 , 6) / (3 , 7) = ?**

○ A: (6/29 , -1/29)
○ B: (2/29 , -2/29)
○ C: (24/29 , 2/29)
○ D: (18/29 , 2/29)

8. $\frac{(1+i)^n}{(1-i)^{n-2}}$ **is equal to?**

○ A: $4i^{n-2}$
○ B: $2i^{n-4}$
○ C: $2i^{n-1}$
○ D: None of the above.

9. **If $z = \frac{\sqrt{3}+i}{2}$, then $(z^{101} + i^{103})^{105}$ is equal to**

○ A: I
○ B: -1
○ C: 0
○ D: 1

10. Reciprocal of i is?

○ A: -1 ○ B: 1

○ C: I ○ D: -i

11. $\dfrac{(1+i)^{2n+1}}{(1-i)^{2n-1}}$ is equal to?

○ A: $2 (-1)^n$ ○ B: 2i

○ C: -2 ○ D: 2 + 2i

12. If Ȳ = y then y is?

○ A: Complex number ○ B: Real number

○ C: Ȳ is complex conjugate of y ○ D: None of the above.

13. The equation $| z - 1 |^2 + | z + 1 |^2 = 2$ represents?

○ A: A circle of radius 1 ○ B: A circle of radius 2

○ C: Ordered pair (0, 0) ○ D: A straight line.

14. The number 4 + 3i lies on the ?

○ A: Imaginary axis of the Argand diagram. ○ B: Real axis of the Argand diagram.

○ C: Neither real nor imaginary axis of the Argand diagram.

○ D: None of the above.

15. Absolute value of complex number z = a + ib = ?

○ A: a + b ○ B: $a^2 + b^2$

○ C: $\sqrt{z.\tilde{z}}$ ○ D: $z.\tilde{z}$

16. **If $z = \left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^5$, then**

○ A: Re (z) > 0 ○ B: Re (z) > 0 and Im (z) > 0

○ C: Re (z) > 0 and Im (z) < 0 ○ D: Im (z) = 0

17. $\sqrt{\dfrac{1}{-4}}$ is equal to?

○ A: i / 2 ○ B: - i / 2

○ C: 2 I ○ D: -2 i

18. If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$ then α^{31} is equal to?

○ A: α ○ B: α^2

○ C: 0 ○ D: 1

19. (a + bi) * (c + di) = ?

○ A: (ac - bd) + (ad + bc) I ○ B: (ac + bd) + (ad + bc) i

○ C: (ac - bd) + (ad - bc) I ○ D: (ac + bd) + (ad - bc) i

Sets & Functions

TEST 1

1. If $A \cap B = \Phi$ then A and B are called?

○ A: Complement of each other.
○ B: Null sets
○ C: Disjoint sets
○ D: Universal sets.

2. Residue class modulo 5 for $4 + 3$ is?

○ A: 2
○ B: 3
○ C: 5
○ D: 7

3. $(A \cup B)' = ?$

○ A: $A' \cup B'$
○ B: $A' \cap B'$
○ C: $A - B$
○ D: $(A - B)'$

4. If $A = \{1,2,3\}$ and $B = \{2,3\}$, then $A \cup B =?$

○ A: $\{1\}$
○ B: $\{2,3\}$
○ C: $\{1,2\}$
○ D: $\{1,2,3\}$

5. A set of all possible sub sets of a set is known as?

○ A: Power set
○ B: Proper subset
○ C: Singleton Set
○ D: Universal set.

6. $A \cap B = \Phi$ then $(A \cup B) = ?$

○ A: $(A \cup B) = A + B$
○ B: $(A \cup B) = A + B - (A \cap B)$
○ C: $(A \cup B) = (A \cap B)$
○ D: Undefined.

7. Set of all integers is not closed with respect to?

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: Division

8. Which of the following is a singleton set?

○ A: $\{\ \}$
○ B: $\{0\}$
○ C: $\{5\}$
○ D: Both B and C.

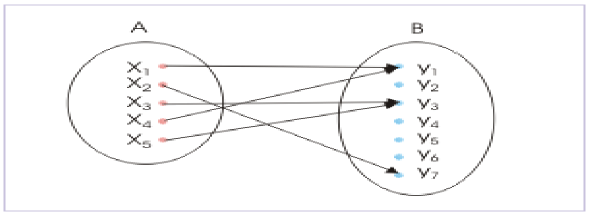
9. Drawing conclusion from limited number of observations is called?

○ A: Induction
○ B: Deduction
○ C: Logic
○ D: Proposition

10. $Z = \{x \mid x = p/q$ where $p,q \in Z$ and $q \neq 0\}$ is a set of?

○ A: Natural numbers
○ B: All integers
○ C: Irrational numbers
○ D: Rational numbers.

11. The figure below shows what kind of function?



○ A: Into function

○ B: (1-1) and into function

○ C: Onto function

○ D: (1-1) and onto function

12. Which of the following relations is true?

○ A: 0 ∈ { }

○ B: 0 ∈ {Φ}

○ C: 0 ∈ {0}

○ D: None of the above.

13. Which of the following is defined with respect to the universal set?

○ A: Difference of two sets.

○ B: Intersetction of sets

○ C: Union of sets

○ D: Complement of sets

14. Aristotelian logic has how many possible outcomes?

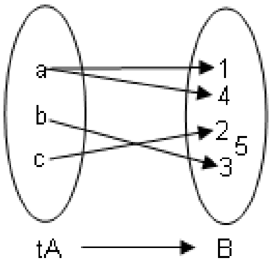
○ A: 1

○ B: 2

○ C: 3

○ D: 4

15. The diagram below shows that?



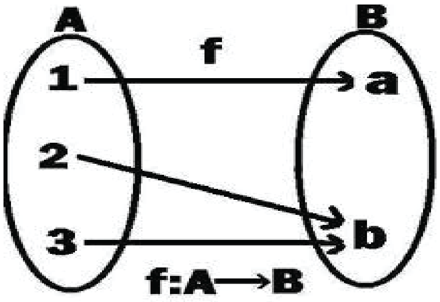
○ A: f is function from A to B

○ B: f is a one-one function from A to B

○ C: f is an onto function from A to B

○ D: f is not a function

16. The figure below shows what kind of function?



○ A: Into function

○ B: (1-1) and into function

○ C: Onto function

○ D: (1-1) and onto function.

17. The domain of the function f = {(1, 3), (3, 5), (2, 6)} is?

○ A: 1, 3 and 2
○ B: {1,3,2}
○ C: 3, 5 and 6
○ D: {3,5,6}

18. Residue class modulo 7 for 9 + 5 is?

○ A: 14
○ B: 7
○ C: 3
○ D: 0

19. There are how many ways of describing a set?

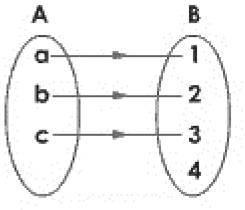
○ A: 1
○ B: 2
○ C: 3
○ D: 4

20. If A is a subset of B then A U B =?

○ A: A
○ B: B
○ C: A – B
○ D: B - A

TEST 2

1. **The figure below shows what kind of function?**



○ A: Into Function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

2. **If (x + 3, y - 2) = (7,5) then (7x, 9y) = ?**

○ A: (3,-2)
○ B: (28,63)
○ C: (35,42)
○ D: (49,54)

3. **If f = {(1, 4), (2, 5), (3, 6)} and g = {(4, 8), (5, 7), (6, 9)}, then (gof) is?**

○ A: { }
○ B: {(1, 8), (2, 7), (3, 9)}
○ C: {(1, 7), (2, 8), (3, 9)}
○ D: None of the above.

4. **Logical form of (A U B)’ = A’ ∩ B’ is?**

○ A: $\sim(p \vee q) = \sim p \wedge \sim q$
○ B: $\sim(p \wedge q) = \sim p \vee \sim q$
○ C: $(p \vee q) = p \wedge q$
○ D: $(p \vee q) \rightarrow \sim p \wedge \sim q$

5. **If A and B are overlapping sets then A - B =?**

○ A: A
○ B: B
○ C: A - (A ∩ B)
○ D: B - (A ∩ B)

6. **To be classified as a group, the set must satisfy how many properties?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

7. **Set of rational + irrational numbers is a set of?**

○ A: All integers
○ B: All real numbers
○ C: Whole numbers
○ D: All of the above.

8. **Let A = {1, 2, 3}. Then, the domain of the relation R = {(1, 1), (2, 3), (2, 1)} defined on A is?**

○ A: {1,2}
○ B: {1,3}
○ C: {1,2,3}
○ D: None of the above.

9. **All students who appear in GIKI entry test are pass, fail or put in the waiting list. If I appear in the GIKI entry test, I may pass, fail or be in the waiting list. This is an example of (choose the most appropriate answer)?**

○ A: Induction
○ B: Deduction
○ C: Aristotelian logic
○ D: Non Aristotelian logic

10. A - B = Φ and A is not an empty then?

○ A: B = Φ
○ B: B - A = Φ
○ C: A is subset of B
○ D: B is subset of A.

11. If a set has 5 elements. Then number of elements in the power set would be?

○ A: 4
○ B: 8
○ C: 16
○ D: 32

12. Let A and B have 3 and 6 elements, respectively. What can be the minimum number of elements in A U B?

○ A: 3
○ B: 6
○ C: 9
○ D: Cannot determine.

13. If f : A → B be defined by f(x) = x + i, where i is a fixed integer and x set of integers, then f is?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function.
○ D: (1-1) and onto function.

14. If a set is closed with respect to an operation and the operation is associative then the set is called?

○ A: Semi group
○ B: Group
○ C: Monoid
○ D: Both A and C.

15. If A = {1, 2, 3} and B = {3, 4} and C = {4, 5, 6} then (A x B) ∩ (B x C) =?

○ A: {(1,4)}
○ B: {(3,4)}
○ C: {(1,4) , (3,4)}
○ D: {(2,4) , (1,3)}

16. The function f = {(1,2) , (1,3) , (1,4)} is a ?

○ A: Into function
○ B: Onto function
○ C: (1-1) onto function
○ D: None of the above.

17. Converse of $q \rightarrow p$ is?

○ A: $p \rightarrow q$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

18. Set of all integers such that $|x-3| < 2$ is?

○ A: {1,2,3,4}
○ B: {1,2,3,4,5}
○ C: {2,3,4}
○ D: None of the above.

19. If A={1,2,3} , B = {1,2,3} and C = {3,2,1} which of the following is true?

○ A: A = B
○ B: C is inverse of A
○ C: A = B = C
○ D: Both A and B.

20. If A is a subset of B then A - B = ?

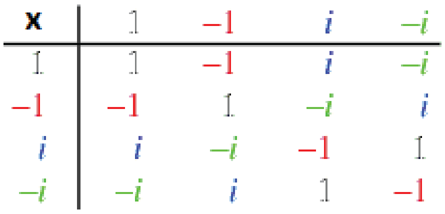
○ A: A
○ B: B
○ C: A - (A U B)
○ D: Φ

TEST 3

1. **In a town, 48% people are educated, 51% people are young, 60% are servicemen, 24% are educated and young, 25% are young and servicemen, 27% are educated and servicemen and 5% have all three characteristics. How many people (in percentage terms)do not have any of these three characteristics?**

   ○ A: 12%
   ○ B: 9%
   ○ C: 5%
   ○ D: 0%

2. **The table below shows multiplication operation on a set S = {1,-1,i,-i}. Which of the following is most accurate about the set w.r.t multiplication?**



x	1	−1	*i*	−*i*
1	1	−1	*i*	−*i*
−1	−1	1	−*i*	*i*
i	*i*	−*i*	−1	1
−*i*	−*i*	*i*	1	−1

   ○ A: It is a monoid
   ○ B: It is a group
   ○ C: It is an abelian group
   ○ D: It is a semi group

3. **In a zoo, there are 42 animals in the first sector, 34 in the second sector and 20 in the third sector. Out of these, 24 graze in sector one and also in sector two, 10 graze in sector two and sector three and 12 graze in sector one and sector three. These figures also include four animals grazing in all the three sectors. Find the total number of animals?**

   ○ A: 46
   ○ B: 50
   ○ C: 54
   ○ D: 60

4. **Let R be a relation in N defined by R = {(1+x , x^2) : x < 5 and x Є N}. Which of the following is false?**

   ○ A: Domain of R = {2,3,4,5}
   ○ B: Range of R = {4,9,16,25}
   ○ C: R = {(1,2) , (2,4) , (3,9) , (4,16) , (5,25)}
   ○ D: R = {(2,4) , (3,9) , (4,16) , (5,25)}

5. **For b Є N, bN = {bx : x Є N} then the first value of the set 6N ∩ 8N is?**

   ○ A: 8
   ○ B: 16
   ○ C: 24
   ○ D: 48

6. **Which of the following is a Singleton set?**

   ○ A: { x : |x|=5 , x Є N}
   ○ B: { x : |x|=15 , x Є Z}
   ○ C: { x : x^2 , x Є Z}
   ○ D: { x : 1 + x , x Є N}

7. **The set {x : x ≠ x} is?**

   ○ A: {0}
   ○ B: {Φ}
   ○ C: {1}
   ○ D: { }

8. **If N_a = {an : n Є N}, find the value of N_6 ∩ N_8?**

   ○ A: N_6
   ○ B: N_8
   ○ C: N_{12}
   ○ D: N_{24}

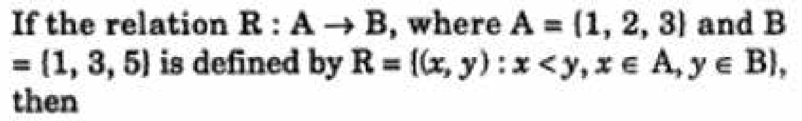
9. **If n(A) = 115 , n(B) = 326 and n(A ∩ B) = 65. Then n(A U B) = ?**

   ○ A: 68
   ○ B: 73
   ○ C: 128
   ○ D: 376

10. Which of the following cannot have a proper subset?

○ A: $\{ x : x \in N\}$ ○ B: $\{ x : x \in Q, 3 < x < 4\}$

○ C: $\{ x : x \in N, 3 < x < 4\}$ ○ D: $\{ x : x \in Z, 3 < x < 6\}$

11. 

If the relation $R : A \to B$, where $A = \{1, 2, 3\}$ and $B = \{1, 3, 5\}$ is defined by $R = \{(x, y) : x < y, x \in A, y \in B\}$, then

○ A: $R = \{(1,3) , (1,5) , (2,3) , (2,5) , (3,5)\}$ ○ B: $R = \{(1,3) , (1,5) , (2,3) , (2,5) \}$

○ C: $R^{-1} = \{(3,1) , (5,1) , (3,2) , (5,2) , (3,3) \}$ ○ D: $R = \{(1,1) , (1,3) , (1,5) , (2,3) , (2,5) \}$

12. Set of cube roots of unit w.r.t addition is?

○ A: Semi group ○ B: Group

○ C: Monoid ○ D: None of the above.

13. If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9 (n - 1) : n \in N\}$, find the value of X U Y?

○ A: X ○ B: Y

○ C: N ○ D: None of the above.

14. Let R by a relation in N defined by $R = \{(x,y) : x + 2y = 8\}$. The range of R is?

○ A: $\{2,4,6\}$ ○ B: $\{1,2,3\}$

○ C: $\{2,4,6,8\}$ ○ D: $\{1,2,3,4,5,6\}$

15. What are the missing entries in the conditional table below? (From top to bottom)

p	q	$p \to q$
T	T	?
T	F	?
F	T	?
F	F	?

○ A: T, F, F, T ○ B: T, T, T, F

○ C: T, F, T, F ○ D: T, F, T, T

16. The number of relations that can be defined on the set A = {a, b, c, d} is?

○ A: 16 ○ B: 24

○ C: 4^4 ○ D: 2^{16}

17. If $n(A) = 115$, $n(B) = 326$ and $n(A-B) = 47$, then $n(A \cap B) = ?$

○ A: 373 ○ B: 158

○ C: 68 ○ D: 44

18. Which of the following is an empty set?

○ A: $\{ x : x \in R \text{ and } x^2 - 3 = 0\}$ ○ B: $\{ x : x \in R \text{ and } x^2 + 3 = 0\}$

○ C: $\{ x : x \in R \text{ and } x + 11 = 0\}$ ○ D: $\{ x : x \in R \text{ and } x^4 - 3 = 0\}$

19. If for two sets A and B we have $(A \cup B) = (A \cap B) = B$, then we have?

○ A: $B = \Phi$ and $A \neq \Phi$ ○ B: $A - B = \Phi$

○ C: $B - A = \Phi$ ○ D: $A = B$

20. The set of fourth roots of unity are closed with respect to?

○ A: Addition
○ B: Division
○ C: Subtraction
○ D: None of the above.

TEST 4

1. The inverse of function {(1,2) , (2,3) , (3,4)} is?

○ A: {(1,2) , (2,3) , (3,4)}
○ B: {(1,1/2) , (1/2,1/3) , (1/3,1/4)}
○ C: {(2,1) , (3,2) , (4,3)}
○ D: {(-1,-2) , (-2,-3) , (-3,-4)}

2. 46 in binary is?

○ A: 100110
○ B: 101111
○ C: 101110
○ D: 101010

3. In a town with a population of 5000, the number of people who are egg eaters is 3200. If 2500 are meat eaters and 1500 eat both egg and meat. How many of them eat neither meat nor egg?

○ A: 4200
○ B: 1500
○ C: 800
○ D: 500

4. If A = {1,2,3,4} then {(x,y) | x+y < 5} is a ?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function `
○ D: Not a function.

5. If A and B are disjoint sets then A - B = ?

○ A: A
○ B: B
○ C: B – A
○ D: Both A and C.

6. A group is called abelian group if?

○ A: It is closed
○ B: It satisfies associativity
○ C: It has inverse as part of the group.
○ D: It satisfied commutativity.

7. Let A = {a, b, c}. Then, the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is?

○ A: {a, b, c}
○ B: {a, b}
○ C: {a}
○ D: {b,c}

8. Contrapositive of $p \rightarrow q$ is?

○ A: $q \rightarrow p$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

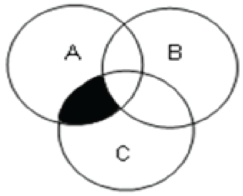
9. X = {0,1,2,3,4 .....} is a set of?

○ A: Natural numbers
○ B: Whole numbers
○ C: All integers
○ D: All of the above.

10. All Irish people drink beer. If someone is Irish he would definitely drink beer. The logic is an example of?

○ A: Proposition
○ B: Induction
○ C: Deduction
○ D: Logic analysis

The shaded area in this diagram represents

11. 

○ A: $A \cap C$

○ B: $(A \cap B) - C$

○ C: $(A - C) \cap (A - B)$

○ D: $(A \cap C) - B$

12. Set of natural numbers is closed with respect to?

Addition, Multiplication, Subtraction

○ A: i only

○ B: ii only

○ C: i and ii only

○ D: i, ii and iii

13. If a function $f: A \rightarrow B$ is such that Ran f = B then f is a/an ?

○ A: Into function

○ B: Onto function

○ C: (1 – 1) and onto

○ D: Both B and C.

14. A, B and C are three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Which of the following conditions is true according to the given statement?

○ A: $A = B$

○ B: $B = C$

○ C: $A = C$

○ D: $A = B = C$

15. The set of cube roots of unit is closed with respect to?

○ A: Multiplication

○ B: Addition

○ C: Subtraction

○ D: None of the above.

16. If set $A = \{1, w, w^2\}$ is an abelian group then inverse of w is?

○ A: 1

○ B: w

○ C: w^2

○ D: Abelian group does not have an inverse.

17. The range of the function $f(x) = |x - 1|$ is? Where domain is the set of all integers.

○ A: $(-\infty, \infty)$

○ B: $(0, \infty)$

○ C: $[0, \infty)$

○ D: $(-\infty, 0)$

18. Which of the following is true about the null set?

It is the subset of every set. Number of elements in its power set is zero. It contains no elements

○ A: iii only

○ B: i and iii only

○ C: ii and iii only

○ D: i, ii and iii.

19. $Z = \{x \mid x \neq p/q$ where $p, q \in Z$ and $q \neq 0\}$ is a set of?

○ A: Natural numbers

○ B: All integers

○ C: Irrational numbers

○ D: Rational numbers.

20. If $A \cap B \neq \Phi$ then $(A \cup B) = ?$

○ A: $A + B$

○ B: $(A \cup B) = A + B - (A \cap B)$

○ C: $(A \cup B) = A + B + (A \cap B)$

○ D: Φ

Matrices & Determinations

TEST 1

1. **Inverse of the matrix $\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ is?**

   ○ A: $10\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$
   ○ B: $\frac{1}{10}\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$
   ○ C: $\frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$
   ○ D: $10\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

2. **The matrix below has order of?**

   $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$

   ○ A: 6 x 1
   ○ B: 2 x 3
   ○ C: 3 x 2
   ○ D: 2 x 2

3. **If *A* and *B* are matrices, then which from the following is true ?**

   ○ A: $A + B \neq B + A$
   ○ B: $(A^t)^t \neq A$
   ○ C: $AB \neq BA$
   ○ D: All are true.

4. **A squar matrix is one in which?**

   ○ A: $n = m^2$
   ○ B: $n^2 = m$
   ○ C: n = m
   ○ D: All numbers are squares of integers.

5. **The number of non-zero rows in an echlon form is called ?**

   ○ A: reduced echlon form
   ○ B: rank of the matrix
   ○ C: conjugate of the matrix
   ○ D: co-factor of the matrix

6. **M_{12} the matrix given below is?**

   $\begin{vmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{vmatrix}$

   ○ A: $\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix}$
   ○ B: $\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix}$
   ○ C: $\begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix}$
   ○ D: $\begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix}$

7. **The matrix given below is a?**

   $\begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 2 & 1 & 5 \end{bmatrix}$

   ○ A: Symmetric.
   ○ B: Skew Symmetric
   ○ C: Hermitian
   ○ D: Skew Hermitian

8. What is the order of the matrix given below?

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

○ A: 6 x 1 ○ B: 2 x 3

○ C: 3 x 2 ○ D: 2 x 2

9. Determinant of singular matrix is ?

○ A: 1 ○ B: positive

○ C: negative ○ D: 0

10. If the system of equations $x - Ky - z = 0$, $Kx - y - z = 0$, $x + y - z = 0$ has a non-zero solution, then the possible values of K are?

○ A: -1, 2 ○ B: 1, 2

○ C: 0, 1 ○ D: -1, 1

11. The following matrix is?

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{bmatrix}$$

○ A: Non singular ○ B: Unit matrix

○ C: Lower triangle. ○ D: Upper Triangle.

12. Value of $\begin{vmatrix} w & 1 & w \\ w & 2 & w \\ w & 3 & w \end{vmatrix}$ **is?**

○ A: w ○ B: 0

○ C: 1 ○ D: 2

13. If A = $\begin{bmatrix} 2 & 5 \\ 5 & 2 \end{bmatrix}$**, then $A^3 - 4A^2$ is equal to**

○ A: $\begin{bmatrix} 42 & 105 \\ -105 & 42 \end{bmatrix}$ ○ B: $\begin{bmatrix} 42 & 105 \\ 105 & 42 \end{bmatrix}$

○ C: $\begin{bmatrix} 105 & 42 \\ 105 & 42 \end{bmatrix}$ ○ D: None of the above.

14. A determinant remains same if :

○ A: Every element in a column is multiplied by the same factor

○ B: Two columns are interchanged. ○ C: Two rows are interchanged.

○ D: Each element of any row is added to the corresponding element of any other row multiplied by given factor

15. For matrices $(AB)^t$ = ?

○ A: A^tB^t ○ B: AB

○ C: B^tA^t ○ D: BA

16. If A = $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A|$ is?

○ A: 2
○ B: 3
○ C: 4
○ D: 5

17. If AB = A then, B is a?

○ A: Unity Matrixq
○ B: Identity Matrix
○ C: Inverse of A
○ D: Both A & B.

18. If the order of matrix *A* is *m* x *p*. And the order of *B* is *p* x *n*. Then the order of *AB* is ?

○ A: m x p
○ B: p x n
○ C: m x n
○ D: n x m

19. For matrices A^{-1} = ?

○ A: $Adj\ A\ |A|$
○ B: $|A| \dfrac{1}{Adj\ A}$
○ C: $\dfrac{1}{|A|\ A} Adj\ A$
○ D: $\dfrac{1}{|A|} Adj\ A$

TEST 2

1. Inverse for the matrix $a = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is?

○ A: $\dfrac{1}{ad-bc}\begin{bmatrix} d & b \\ c & a \end{bmatrix}$
○ B: $\dfrac{1}{ab-cd}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
○ C: $\dfrac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
○ D: $\dfrac{1}{ad-bc}\begin{bmatrix} -d & -b \\ -c & -a \end{bmatrix}$

2. For matrices if AX = B then which of the following conditions holds?

○ A: $X = A^{-1}B$
○ B: $A^{-1}(AX) = BA^{-1}$
○ C: $X = BA^{-1}$
○ D: All of the above.

3. For matrices, if AX=B then X = ?

○ A: B / |A|
○ B: $\dfrac{1}{|A|} * adj(A.B)$
○ C: $B.(\dfrac{1}{|A|} adjA)$
○ D: $(\dfrac{1}{|A|} * adjA).B$

4. Fine the cofactor A_{23} for the matrix $\begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix}$

○ A: 7
○ B: 0
○ C: 23
○ D: -7

5. The matrix $B = \begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$ **can be defined as?**

○ A: Symmetric
○ B: Skew Symmetric
○ C: Triangular
○ D: Hermitian

6. Find the cofactor A_{22} for the $\begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

○ A: 8
○ B: -7
○ C: -10
○ D: 3

7. If A is a square matrix, then A^{-1} does not exist if

○ A: $|A|>0$
○ B: $|A|<0$
○ C: $|A|=0$
○ D: $A\neq0$

8. Value of determinance is?

○ A: 0
○ B: 1
○ C: x+y+z+w
○ D: xyzw

If

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

9. then order of matrix A = ?

○ A: 3 x 2
○ B: 2 x 3
○ C: 3 x 3
○ D: 2 x 2

10. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

○ A: 8
○ B: -8
○ C: 400
○ D: 0

11. If I is an identity matrix, then?

○ A: $I^n=0$
○ B: $I^n=I$
○ C: $2I=0$
○ D: None of these.

12. If x, y and z are non zero numbers. The inverse of matrix $\begin{bmatrix} x & y \\ z & 1 \end{bmatrix}$ **is?**

○ A: $\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$
○ B: $\frac{1}{x-yz}\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$
○ C: $\begin{bmatrix} 1 & -y \\ -z & -x \end{bmatrix}$
○ D: None of these.

13. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then?

○ A: $\alpha = a^2 + b^2, \beta = -2ab$

○ B: $\alpha = a^2 + b^2, \beta = ab$

○ C: $\alpha = a^2 - b^2, \beta = 2ab$

○ D: $\alpha = a^2 + b^2, \beta = 2ab$

14. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 23 \\ 0 & -10 \end{bmatrix}$ then |AB| is?

○ A: 80

○ B: 100

○ C: -110

○ D: 90

15. The number of non-zero rows when a matrix is reduced to echelon matrix form is known as?

○ A: Rank of the matrix.

○ B: Degree of matrix.

○ C: Skew echelon of matrix.

○ D: None of the above.

16. If augmented matrix of a system is of form $\begin{bmatrix} 1 & 0 & : & 5 \\ 0 & 1 & : & -3 \end{bmatrix}$ Solution to the equations of the system is?

○ A: 1 and 0

○ B: 0 and 1

○ C: 5 and -3

○ D: None of the above.

17. The value of the determinant given below is equal to

$$\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$$

○ A: 6 xyz

○ B: xyz

○ C: 4 xyz

○ D: xy + yz +zx

18. If a matrix A is multiplid with a number k then the determinant of resulting matrix is?

○ A: k |A|

○ B: 1/k |A|

○ C: k^2|A|

○ D: |A|

19. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

○ A: -3, 1

○ B: -1, 3

○ C: 3, 1

○ D: -3, -1

20. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ then A^2= ?

○ A: $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$

○ B: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

○ D: $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

TEST 3

1. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

○ A: [2, 4]
○ B: [0, 4]
○ C: [1, 4]
○ D: None of these.

2. If A and B are symmetric matrices, then AB + BA is a?

○ A: Symmetric matrix
○ B: Skew symmetric matrix
○ C: Diagonal matrix
○ D: Triangular matrix

3. Which of the following is an Echelon form of a matrix?

○ A: $\begin{bmatrix} 0 & 1 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$
○ C: $\begin{bmatrix} 0 & 2 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 8 \end{bmatrix}$
○ D: Both A & B.

4. 1, 2, 3, 4 are four numbers. If a matrix of order m x n is formed by using all the four numbers, then how many set of values (m, n) are possible?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

5. If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

○ A: $\begin{bmatrix} 13 & 4 \\ 8 & 5 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$
○ C: $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$
○ D: $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

6. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x, y not equal to zero, then D is

○ A: Divisible by neither x nor y.
○ B: Divisible by both x and y
○ C: Divisible by x but not y
○ D: Divisible by y but not x

7. $\begin{vmatrix} a+x & b & c \\ a & b+y & c \\ a & b & c+z \end{vmatrix}$ is equal to

○ A: $xyz\,(1 + a/x + b/y + c/z)$
○ B: $xyz\,(1 + x/a + y/b + z/c)$
○ C: $xyz\,(1 + x + y + z)$
○ D: $xyz\,(1 + a + b + c)$

Let A = $\begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$

8. If $|A|^2 = 25$, then $|\alpha|$ is equal to

○ A: 1/5q

○ B: 5

○ C: 1

○ D: 25

9. If A = $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ such that $A + A^C = I$, then value of α is

○ A: $\pi/6$

○ B: $\pi/3$

○ C: π

○ D: 0

10. Which is the following is the condition for a Skew Hermitian matrix?

○ A: $(\bar{A})^t = A$

○ B: $(\bar{A})^t = A^2$

○ C: $(\bar{A})^t = -A$

○ D: $\bar{A}^t = -A^2$

11. Let Δ = $\begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$**, where a = i, b = ω, c = ω^2, then Δ is equal to**

○ A: I

○ B: -1

○ C: 1

○ D: -i

12. If f(x) = $\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$, then f(100) is equal to

○ A: 0

○ B: 1

○ C: 100

○ D: -100

13. The solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$ is

○ A: 1, 2, 3

○ B: 1, 2, -3

○ C: -1, 2, 3

○ D: -1, -2, 3

14. Which of the following is true for Echelon Form of a Matrix?

○ A: In any row, the number of zeros before the leading entry is greater than the number of such zeros in the preceding row.

○ B: All non zero rows preceeds row including zeros.

○ C: First entry in any non zero row is 1.

○ D: All of the above.

15. The matrix $A = \begin{bmatrix} 1 & 1-i \\ 1+i & 2 \end{bmatrix}$ **is a?**

○ A: Symmetric Matrix

○ B: Hermitian Matrix

○ C: Skew symmetric matrix

○ D: Skew hermitian matrix

16. The value of the determinate $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

○ A: 5√3 (-√6 – 5)
○ B: 5√3 (√6 – 5)
○ C: 5√3 (5 - √6)
○ D: √3 (√6 – 5)

17. If A and B are symmetric matrices, then AB would equal to?

○ A: -BA
○ B: BA
○ C: 0
○ D: I

18. In reduced echelon form of the matrix if first non zero entry of a row lies in Column j, all other entries in the column are?

○ A: Positive
○ B: Negative
○ C: Zero
○ D: None of the above.

TEST 4

1. For the matrix below find the |A|?

$$A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

○ A: 30
○ B: 40
○ C: 50
○ D: 60

2. A triangular matrix is always a?

○ A: Echelon form of Matrix.
○ B: Reduced Echelon form of Matrix.
○ C: Square matrix.
○ D: Non of the above.

3. What is the conjugate of matrix $A = \begin{bmatrix} i & 10+i \\ -2i & 1-i \end{bmatrix}$

○ A: $\begin{bmatrix} -i & 10+i \\ -2i & 1+i \end{bmatrix}$
○ B: $\begin{bmatrix} i & 10-i \\ 2i & 1-i \end{bmatrix}$
○ C: $\begin{bmatrix} -1 & 10-i \\ 2 & 1+i \end{bmatrix}$
○ D: $\begin{bmatrix} -i & 10-i \\ 2i & 1+i \end{bmatrix}$

4. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

○ A: α=1
○ B: α=0
○ C: α=-1
○ D: None of these.

5. **The matrix A =** $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ **can be described as?**

○ A: Hermitian ○ B: Skew Hermitian

○ C: Symmetric ○ D: Skey Symmetric.

For a system of equations,

x + 3y + 2z = 3

4x + 5y -3z = -3

3x - 2y +17z = 42

6. **Fine the values of x, y and z if the echelon form of matrix is** $\begin{bmatrix} 1 & 3 & 2 & :3 \\ 0 & 1 & -1 & :-3 \\ 0 & 0 & 1 & :2 \end{bmatrix}$

○ A: x = 2 ; y = -1; z = 2 ○ B: x = -2 ; y= 1; z= 2

○ C: x = 4 ; y = -1; z = 2 ○ D: x= 2 ; y =-2; z = 2

7. **Find the value of a if the following matrix is singular** $\begin{bmatrix} -4 & 2 \\ -6 & a \end{bmatrix}$

○ A: -3 ○ B: 3

○ C: 5 ○ D: -5

8. **If A=**$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ **and A is symmetric then?**

○ A: x=0, y=5 ○ B: x+y=5

○ C: x=y ○ D: None of the above.

9. **Let** $A = \begin{vmatrix} 1 & bc & a(b+c)) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b)) \end{vmatrix}$**. Value of A is equal to?**

○ A: ab + bc +ca ○ B: a + b + c

○ C: $(a + b + c)^2$ ○ D: None of the above

10. **If in a square matrix A two rows or two columns are interchanged the determinant of the resulting matrix is?**

○ A: A^{-1} ○ B: -|A|

○ C: |A| ○ D: None of the above.

11. **What is the rank of the matrix** $A = \begin{bmatrix} 1 & 0 & 7 & -2 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

12. What is value of the determinant $A = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{vmatrix}$

○ A: 25 ○ B: -25

○ C: 30 ○ D: -30

13. If ω is the cube root of unity then the value of is ?

○ A: $a^3 + b^3 + c^3$ ○ B: ab - bc

○ C: 0 ○ D: $a^3 + b^3 + c^3$ -3abc

14. If x + ay = 0; y + az = 0; z + ax = 0, then the value of 'a' for which the system of equations will have infinite number of solutions is?

○ A: 1 ○ B: 0

○ C: -1 ○ D: None of these.

Quadratic Equations

TEST 1

1. Find the value of x where $9x^2 - 12x - 5 = 0$.

○ A: -1/3 , 5/3
○ B: -2/3 , 5/3
○ C: -1/3, 2/3
○ D: 2/3 , 5/3

2. $\omega^{-12} = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: 0

3. If x-a is a factor of f(x) then f(a) = ?

○ A: a
○ B: 0
○ C: 1
○ D: w

4. Solution to the equation $6x^2 + x - 15 = 0$ is?

○ A: 3/2 , -3/2
○ B: 6/7 , -4/5
○ C: 3/2 , -5/3
○ D: None of the above.

5. Roots of the equation $2x^2 + 5x - 1$ are?

○ A: Complex
○ B: Irrational
○ C: Equal
○ D: Rational

6. The condition for polynomial equation $ax^2 + bx + c = 0$ to be quadratic is?

○ A: $a > 0$
○ B: $a < 0$
○ C: $a \neq 0$
○ D: $a \neq 0$ and $b \neq 0$

7. If the product of the roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, the value of m is?

○ A: 1
○ B: -1
○ C: 1/3
○ D: -1/3

8. Quadratic equations are?

○ A: First degree polynomials.
○ B: Second degree polynomials.
○ C: Third degree polynomials.
○ D: Fourth degree polynomials.

9. $1 + \omega + \omega^2 = ?$

○ A: 1
○ B: ω
○ C: ω^2
○ D: 0

10. For quadratic equation $ax^2 + bx + c = 0$, Sum of roots is equal to?

○ A: b/a
○ B: -b/a
○ C: c/a
○ D: -c/a

11. If S and P are the sum and products of the roots of the quadratic equation, then the equation may be written as?

○ A: $x^2 + Sx + P = 0$
○ B: $x^2 - Sx - P = 0$
○ C: $x^2 - Sx + P = 0$
○ D: $x^2 + Sx - P = 0$

12. Roots of the equation $x^2 + 7x + 12$ are?

○ A: 3, 4 ○ B: -3, 4

○ C: 3, -4 ○ D: -3, -4

13. Sum of all fourth roots of unit is?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

14. Product of all fourth roots of unity are?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

15. $\frac{-1+\sqrt{3}i}{2} * \frac{-1-\sqrt{3}i}{2}$ **= ?**

○ A: $\frac{-1+\sqrt{3}i}{2}$ ○ B: $\frac{-1-\sqrt{3}i}{2}$

○ C: 1 ○ D: 0

16. The solution for equation $x^2 - x = 2$ is?

○ A: 1 , -2 ○ B: -1, 4

○ C: 2, -1 ○ D: 2, -3

TEST 2

1. The degree of the equation $x^4 + 1/ x^4 - 3 = 0$ is?

○ A: 4

○ B: 6

○ C: 8

○ D: None of the above.

2. $x + 2$ is a factor of ?

○ A: $x^4 + 2$

○ B: $x^4 - x^2 + 12$

○ C: $x^4 - 2x^3 - x + 2$

○ D: $x^4 + 2x^3 - x – 2$

3. If the equation $x^3 + 4x^2 - 2x + 5$ is divided by $x-1$ the remainder is?

○ A: 10

○ B: 9

○ C: 8

○ D: 7

4. $\omega^{-5} = ?$

○ A: ω

○ B: ω^2

○ C: 1

○ D: None of the above.

5. The equation $\sqrt{x+3} + \sqrt{x+5} = \sqrt{3x+2}$ is called?

○ A: Radical equation

○ B: Exponential equation

○ C: Reciprocal equation

○ D: Square root equation.

6. The equation $2^{2x} + 4^x - 10 = 0$ is?

○ A: Radical equation

○ B: Exponential equation

○ C: Reciprocal

○ D: None of the above.

7. Out of the three cube roots of unit, how many are imaginary?

○ A: 1

○ B: 2

○ C: 3

○ D: Zero

8. If ω is the complex cube root of unity then $\omega = ?$

○ A: 0

○ B: 1

○ C: ω^2

○ D: ω^{-1}

9. If $x^2 + 1/x^2 = 27$, then the value of $x – 1/x$ is equal to ?

○ A: 5

○ B: 4

○ C: 3

○ D: 2

10. If the equation $x^3 + 4x^2 - 2x + 5 = 0$ is divided by $x+1$ the remainder is?

○ A: 10

○ B: 9

○ C: 8

○ D: 7

11. If one root of the equation $x^2 + px + q = 0$ is double the other, p^2/q is?

○ A: 1

○ B: 1/2

○ C: 2/9

○ D: 9/2

12. Roots of the equation $x^2 + 2x + 3 = 0$ are?

○ A: Unequal ○ B: Real

○ C: Complex ○ D: Both A & C.

13. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is?

○ A: 12 ○ B: 4

○ C: 23/6 ○ D: 49/4

14. $1/\omega$ = ?

○ A: ω ○ B: ω^2

○ C: 1 ○ D: 0

15. If the roots of $ax^2 + b = 0$ are real and distinct, then?

○ A: $ab > 0$ ○ B: $a = 0$

○ C: $a > 0$ and $b < 0$ ○ D: $ab < 0$

16. If $b^2 - 4ac$ for a quadratic equation is a perfect square the roots are?

○ A: Rational ○ B: Irrational

○ C: Complex ○ D: None of these.

17. Cube roots of 8 are?

○ A: $-2, -2w$ and $-2w^2$ ○ B: $2, 2w$ and $2w^2$

○ C: $2, w$ and w^2 ○ D: $1, w$ and w^2

18. The roots of the equation $9x^2 - 12x + 4 = 0$ are?

○ A: Equal ○ B: Complex

○ C: Irrational ○ D: Unequal

19. If j and k are the roots of the equation $2x^2 - 4x + 5 = 0$ then $(j+1)(k+1)$ = ?

○ A: 11/2 ○ B: -11/2

○ C: 2/11 ○ D: -2/11

20. $x^4 - 2x^3 + 8x^2 - 2x + 1$ is called?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal equation ○ D: None of the above.

TEST 3

1. **$(1 + w - w^2)^8$ = ? where w is cube root of unity**.

○ A: $256w^2$
○ B: $-256w^2$
○ C: $256w$
○ D: $-256w$

2. For what value of m the given equation would have equal root.

$(m + 1)x^2 + 2(m+3)x + m + 8 = 0$

○ A: ½
○ B: 1/3
○ C: -1/3
○ D: 2/3

3. The number of real solutions of $|x|^2 + 3|x| + 2 = 0$ is?

○ A: 1
○ B: 2
○ C: 3
○ D: 0

4. The roots of equation $x^2 + k = 0$, $k < 0$, are?

○ A: Complex conjugates
○ B: Real and distinct
○ C: Real and same
○ D: Rational

5. The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is

○ A: 2
○ B: -2
○ C: 0
○ D: None of these.

6. If the roots of the equation $ax^2 + bx + c = 0$ are such that their sum is equal to the sum of their squares, then?

○ A: $2ac = ab + b^2$
○ B: $2ac = a^2 + b^2$
○ C: $2ac = ab + b^3$
○ D: None of the above.

If α, β be the roots of $x^2 - 2x + 4 = 0$, $(\alpha^5 + \beta^5)$ = ?

Hint: $(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$.

○ A: 243
○ B: 81
○ C: 64
○ D: 32

7. If the equation $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a common non-zero root, the value of λ is?

○ A: -1
○ B: 1
○ C: 3
○ D: -3

8. The number of real roots of $(x + 1/x)^3 + (x + 1/x) = 0$ is

○ A: 0
○ B: 2
○ C: 4
○ D: 6

9. If $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, the value of (a + b) is?

○ A: 1
○ B: -1
○ C: 2
○ D: 1/2

10. If α and β are the roots of the equation $ax^2 + bx + c$, what is equation with roots 1/α and 1/β?

○ A: $cy^2 + by - a = 0$
○ B: $cy^2 - by - a = 0$
○ C: $y^2 + by + a = 0$
○ D: $cy^2 + by + a = 0$

11. If x = $(3 + \sqrt{5})$, the value of $(2x^3 - 9x^2 - 10x + 13)$ is ?

○ A: 0
○ B: 1
○ C: $12\sqrt{5}$
○ D: None of the above.

12. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3$ is equal to

○ A: -1
○ B: 0
○ C: 1
○ D: 2

13. If one root of the equation $ax^2 + bx + c = 0$ is twice the other, then?

○ A: $2b^2 = 9ac$
○ B: $b^2 = 4ac$
○ C: $b^2 = 9ac$
○ D: $3b^2 = ac$

14. Only one of the root of the equation $ax^2 + bx + c = 0$, is zero, and $a \neq 0$ if,

○ A: $c = 0$
○ B: $c = 0$ and $b \neq 0$
○ C: $b = 0$ and $c = 0$
○ D: $b \neq 0$ and $c \neq 0$

15. If α and β are the roots of equation $ax^2 + bx + c = 0$ the value of $\alpha^2 + \beta^2$ is?

○ A: $\frac{b^2 + 2ca}{a^2}$
○ B: $\frac{b^2 - 2ca}{a}$
○ C: $\frac{b^2 - 2ca}{a^2}$
○ D: $\frac{b - 2ca}{a^2}$

16. If a > 0 and x = $\sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \ldots\ldots\ldots\ldots\infty}}}}$, the value of x is

○ A: $\frac{\sqrt{4a - 1}}{2}$
○ B: $\frac{1 \pm \sqrt{4a + 1}}{2}$
○ C: $\frac{-1 \pm \sqrt{4a + 1}}{2}$
○ D: $\frac{-2 \pm \sqrt{4a + 1}}{2}$

17. The roots of the equation $3^{2x+3} + 37 = 10\,(73.3^x + 1)$ are?

○ A: 2, -2
○ B: 3 , -3
○ C: 8 , 1/9
○ D: 3 , 1/3

18. Roots of the equation $x^2 + 5x - 1 = 0$ are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of the above.

19. If $\alpha + \beta = 4$ and $\alpha^3 + \beta^3 = 44$, α, β are the roots of ?

○ A: $2x^2 - 7x + 16 = 0$
○ B: $3x^2 + 9x + 11 = 0$
○ C: $9x^2 - 27x + 20 = 0$
○ D: None of the above.

TEST 4

1. **The equation $x^5 + x^3 + 2x + 1 = 0$ has**

○ A: No positive roots ○ B: Some positive roots
○ C: No negative roots ○ D: None of the above.

2. $(-1+\sqrt{-3})^4 + (-1-\sqrt{-3})^4 = ?$

○ A: 16ω ○ B: -16
○ C: 16 ○ D: $16\omega^2$

3. **For quadratic equations, If $b^2 - 4ac$ is a perfect square then the roots are?**

○ A: Rational ○ B: Irrational
○ C: Equal ○ D: Complex

4. **The number of real roots of the equation $x^6 - 7x^3 - 8 = 0$ is?**

○ A: 1 ○ B: 2
○ C: 3 ○ D: 6

5. **If $x^3 + kx^2 - 7x + 6$ is divided by $x + 2$, the remainder is -8. The value of k is?**

○ A: 5 ○ B: -5
○ C: 1 ○ D: -1

6. **If the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 58$ is divided by $(x - 2)$, then the quotient must be?**

○ A: $x^3 + 5x^2 + 17$ ○ B: $x^3 + 3x + 5$
○ C: $x^3 + 7x^2 + 17x + 29$ ○ D: $x^3 + 17x + 29$

7. **If $x^3 + x^2 + x + 1 = 0$ then possible values of x are?**

○ A: 1, i, -I ○ B: -1, i^2, -i
○ C: -1, i, -I ○ D: None of the above.

8. **If $x + 1/x = 1$ then $x^3 + 1/x^3$ is equal to**

○ A: 1 ○ B: -1
○ C: 2 ○ D: -2

9. **If two of the four roots of 625 are 5 and 5i then the other two roots are?**

○ A: -5, -5i ○ B: 5, 5i
○ C: -25, -25i ○ D: None of the above.

10. **$(x + \omega y) . (x + \omega^2 y) = ?$**

○ A: $x^2 - 2xy + y^2$ ○ B: $x^2 + 2xy + y^2$
○ C: $x^2 + xy + y^2$ ○ D: $x^2 - xy + y^2$

11. **If 5 + i be one of the roots of a given equation f(x) = 0 with real coefficients, then the lowest degree of such an equation must be?**

○ A: 2 ○ B: 3
○ C: 6 ○ D: Not enough information given to answer the question.

12. $\left(\frac{-1-\sqrt{3}i}{2}\right)^2$ **= ?**

○ A: $\left(\frac{-1+\sqrt{3}i}{2}\right)$

○ B: 1

○ C: $\left(\frac{-1+i}{2}\right)$

○ D: $\left(\frac{-1-i}{2}\right)$

13. If α, β are the roots of the equation $x^2 + x + 1 = 0$, the equation whose roots are α / β and β / α is?

○ A: $x^2 + x + 1 = 0$

○ B: $x^2 - x + 1 = 0$

○ C: $x^2 + x - 1 = 0$

○ D: $x^2 - x - 1 = 0$

14. $1 + \omega^4 = ?$

○ A: $1 + \omega$

○ B: $-\omega^2$

○ C: 1

○ D: Both A and B.

15. if $x + y = 7$ and $x^2 - xy + y^2 = 13$; What are the values of x and y?

○ A: (1,2) (-1,3)

○ B: (4,5) (-2,3)

○ C: (1,5) (2,5)

○ D: (4,3) (3,4)

16. An expression of the type $a_nx^n + a_{n-1}x^{n-1} + \ldots + a_1x + a_0 = 0$ is called

○ A: Polynomial of degree

○ B: Polynomial of degree 1

○ C: Polynomial of degree 2

○ D: Polynomial of degree n

17. If the equations $x^2 + ax + b = 0$ and $x^2 + Ax + B = 0$ have a common root say ' t ', ' t ' must be equal to?

○ A: (B - b) / (a - A)

○ B: (a - A) / (b - B)

○ C: (a + A) / (B - b)

○ D: None of the above.

18. If $2 + i\sqrt{3}$ is a root of the equation $x^2 + p\,x + q = 0$ (p & q being real), then p + q is equal to?

○ A: 3

○ B: -3

○ C: √3

○ D: - √3

19. The roots of the equation $12x^2 + mx + 5 = 0$ will be in the ratio 3 : 2, if m is equal to

○ A: 1/12

○ B: 5/12

○ C: 5 √ 10

○ D: 5/12 √ 10

Sequences & Series

TEST 1

1. **If a series has a common ratio between two terms. It is called?**

○ A: Geometric series.
○ B: Arithmetic series
○ C: Harmonic series
○ D: None of the above.

2. **Sum of infinite GP does not exist if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: Both B & C.

3. **Sum of infinite geometric series exists if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

4. **If the sum of first n positive integers is 1/5 times the sum of their square. Then n equals?**

○ A: 5
○ B: 6
○ C: 7
○ D: 8

5. **Find next term for the series,**
1, -3, 5, -7, 9, ?

○ A: -9
○ B: -11
○ C: -13
○ D: -15

6. **If AP has a=1, $t_n = 20$ and $S_n = 399$, then the value of n is?**

○ A: 20
○ B: 32
○ C: 38
○ D: 40

7. **The 6th term of HP is 1/61 and tenth term is 1/105. The first term of HP is?**

○ A: 1/39
○ B: 1/28
○ C: 1/17
○ D: 1/6

8. **What are the number of terms in an AP if $a_1=3$, d=7 and $a_n=59$.**

○ A: 6
○ B: 7
○ C: 8
○ D: 9

9. **If first two terms of H.P are 1/2 and 1/4 then fourth term is?**

○ A: 1/6
○ B: 1/8
○ C: 1/10
○ D: 1/12

10. **Write the first four terms of the arithmetic sequence if $a_1 = 5$ and other three consecutive terms are** 23,26,29.?

○ A: 5, 10, 15, 20
○ B: 5,8,11,14
○ C: 5, 9, 13, 17
○ D: None of the above.

11. 3, 6, 12 is?

○ A: AP
○ B: GP
○ C: HP
○ D: None of the above.

12. 5th term of the GP 3, 6, 12 is?

○ A: 32
○ B: 36
○ C: 42
○ D: 48

13. If the first and the sixth terms of a G.P are 2 and 64, then its common ratio is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

14. If $x = 1 + y + y^2$ .... infinity. The value of y is?

○ A: $x / (x-1)$
○ B: $x / (1-x)$
○ C: $(x-1) / x$
○ D: $(1-x) / x$

15. Arithmetic mean is given by formula?

○ A: $(ab)^{1/2}$
○ B: $ab / (a + b)$
○ C: $(a + b) / 2$
○ D: None of the above.

16. Arithmetic mean between $1 - x + x^3$ and $1 + x + x^3$ is?

○ A: $1 + x^3$
○ B: $1 - x^3$
○ C: $1 + x$
○ D: $1 - x$

17. nth term of GP is given by formula?

○ A: $a_n=a_1r^n$
○ B: $a_n=a_1r^{n+1}$
○ C: $a_n=a_1r^{n-1}$
○ D: $a_n=a_1r^{n-2}$

18. The harmonic mean of $a / (1 - ab)$ and $a / (1 + ab)$ is?

○ A: $a / (1 - ab)$
○ B: $a / (1 - a^2b^2)$
○ C: a
○ D: $1 / (1 - a^2b^2)$

19. An infinite GP is oscillatory if?

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

20. What is the geometric mean between -2i and 8i?

○ A: ±4
○ B: ±4i
○ C: 3i
○ D: 8i

TEST 2

1. If the numbers a, b, c, d, e form an A.P then the value of a - 4b + 6c - 4d + e is?

○ A: 1 ○ B: 2

○ C: 0 ○ D: None of the above.

2. $\sum_{k=1}^{n} k^2 = ?$

○ A: n ○ B: n(n+1) / 2

○ C: n(n+1)(2n+1) / 6 ○ D: $[\ n(n+1)/2\ ]^2$

3. If 5 is HM between 2 and b then the value of b is?

○ A: 12.5 ○ B: 10

○ C: -10 ○ D: 8

4. What is the common ratio if $a_4 = 8/27$ and $a_7 = -64/729$?

○ A: ¼ ○ B: -1/3

○ C: -2/3 ○ D: -3/7

5. If x, y, z are in A.P, then (x + 2y - z) (2y + z - x) (z + x - y) = ?

○ A: xyz ○ B: 2xyz

○ C: 4xyz ○ D: 6xyz

6. If | x | < 1 and $y = x + x^2 + x^3 + \ldots \ldots \infty$, then x is equal to?

○ A: 0 ○ B: xy

○ C: y / (1-y) ○ D: y / (1+y)

7. The sum of the series $\sqrt{3} + 1/\sqrt{3} + 1/3\sqrt{3}$ .... ∞ is equal to ?

○ A: √3 / 2 ○ B: 3√3 / 2

○ C: 3 ○ D: √3

8. If a, b, c are in A.P as well as in G.P then?

○ A: $a = b \neq c$ ○ B: $a \neq b = c$

○ C: $a \neq b \neq c$ ○ D: $a = b = c$

9. The nth terms of the two series: 3 + 10 + 17 + ------- and 63 + 65 + 67+......... are equal. Then the value of n is?

○ A: 9 ○ B: 13

○ C: 19 ○ D: 21

10. If the quadratic equation $(b^2 + c^2)x^2 - 2(a + b)cx + (c^2 + a^2) = 0$ has equal roots, then

○ A: a, b, c are in G.P ○ B: a, b, c are in A.P

○ C: a, c, b are in G.P ○ D: a, c, b are in A.P

The harmonic mean of the roots of the equation

11. $(5+\sqrt{2})x^2 - (4+\sqrt{5})x + 8 + 2\sqrt{5} = 0$ **is**

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

12. If $a_n = (-3)\,(2/5)^n$ what the value of a_1 and r for the GP?

○ A: -6/5 and 2/5 ○ B: 6/5 and 2/5

○ C: 3/8 and 1/5 ○ D: -3/8 and 1/5

13. If in an AP $a_{25} - a_{20} = 45$, then d is equal to?

○ A: 9 ○ B: -9

○ C: 18 ○ D: 23

14. If $\frac{1}{x+y}$, $\frac{1}{2y}$, $\frac{1}{y+z}$ are in H.P, then x, y, z are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

15. For AP $T_{18} - T_8 = ?$

○ A: d ○ B: 2d

○ C: 10d ○ D: 26d

16. The value of the recurring fraction $0.0\overline{102}$ is?

○ A: 17 / 1665 ○ B: 102 / 9999

○ C: 102 / 10000 ○ D: 34 / 3339

17. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + 100^3)^{1/2} \div 100$ is?

○ A: √100 ○ B: 100

○ C: 100.5 ○ D: 50.5

18. If a, b, c, d, e, f are A.Ms (Arithmetic Means) between 2 and 12, then a + b + c + d + e + f is equal to?

○ A: 14 ○ B: 42

○ C: 64 ○ D: 82

19. The number of terms between 30 and 530, which are divisible by 11, is?

○ A: 30 ○ B: 40

○ C: 46 ○ D: 52

20. Find the sum of infinite GP 2, √2, 1 .....

○ A: 4 + √2 ○ B: 2 + 2√2

○ C: 4 + 2√2 ○ D: 2+ 7√2

TEST 3

1. **If $a^x = b^y = c^z = d^t$ and a, b, c, d are in G.P then x, y, z, and t are in?**

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

2. **If a^2, b^2, c^2 are in A.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in**

○ A: G.P ○ B: H.P

○ C: A.P ○ D: None of the above.

3. **If mth term of H.P is n and nth term is m, then (m+n)th term is?**

○ A: mn / (m+n) ○ B: m / (m+n)

○ C: n / (m+n) ○ D: (m-n) / (m+n)

4. **If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to**

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

5. **If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then a, b, c, d are in**

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

6. **If m^{th} term of an A.P is n and n^{th} term is m, then the $(m + n)^{th}$ term is ?**

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

7. **If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, and $b \neq a + c$, then a, b, c are**

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

8. **If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} (ab)^n$, where $|a|, |b| < 1$, then**

○ A: xyz = x + y + z ○ B: xy + z = xz + yz

○ C: xy + yz = xz + y ○ D: xy + xz = yz + x

9. **If $a^x = b^y = c^z$ and a, b, c are in G.P then x, y, z are in?**

○ A: A.P ○ B: H.P

○ C: G.P ○ D: None of the above.

10. **If a, b, c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point and that point is**

○ A: (-1. -2)
○ B: (-1, 2)
○ C: (1, -2)
○ D: (1, 2)

11. **The harmonic mean of two numbers is 4. Their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 27$, the numbers are**

○ A: 2, 15
○ B: 9, 12
○ C: 6, 3
○ D: 4, 8

12. **Between 1 and 31 are inserted m arithmetic means, so that the ratio of the 7th and $(m-1)$th means is 5 : 9. Then the value of m is**

○ A: 12
○ B: 13
○ C: 14
○ D: 15

13. **If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to**

○ A: 75
○ B: 430
○ C: 864
○ D: 900

14. If the sum of an infinite G.P is 3 and the sum of the squares of its terms is also 3, then its first term and common ratio are?

○ A: 3/2, ½
○ B: 4/7, 1/3
○ C: 1, 1/2
○ D: 1/8, 3/8

15. **If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P., then**

○ A: p, q, r are in A.P
○ B: q^2, p^2, r^2 are in A.P
○ C: p^2, q^2, r^2 are in A.P
○ D: p, r, q are in A.P

16. **If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x \, dx$, then $I_1, I_2, I_3, \ldots\ldots$ are in**

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

17. The sum of integers from 1 to 100 which are not divisible by 3 or 5 is?

○ A: 2438
○ B: 4745
○ C: 2317
○ D: 2632

18. The sum of all the odd numbers of four digits which are divisible by 9 is ?

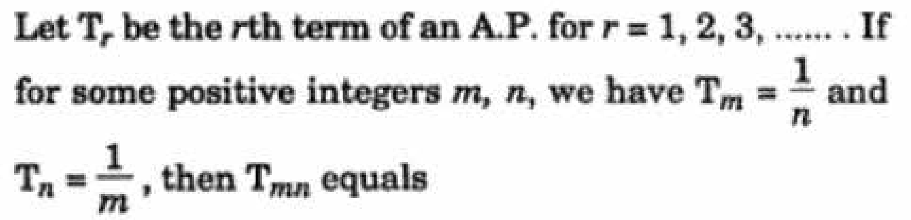
○ A: 11007000 ○ B: 4362000

○ C: 6743000 ○ D: 2754000

19. The sum of 100 terms of the series $1^2 - 2^2 + 3^2 - 4^2 +$ .... is?

○ A: -5050 ○ B: -4720

○ C: -3870 ○ D: -2490

20. 

Let T_r be the rth term of an A.P. for $r = 1, 2, 3,$ .... If for some positive integers m, n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then T_{mn} equals

○ A: 1 ○ B: 0

○ C: 1 / mn ○ D: 1/m + 1/n

TEST 4

1. $1 + 2 + 3 + 4 + \ldots\ldots n$ =?

○ A: n
○ B: $n(n+1) / 2$
○ C: $n(n+1) / 6$
○ D: $n(n+1)(2n+1) / 6$

2. If 5 and 8 are two AMs between a and b. What is the value of a and b?

○ A: 3, 14
○ B: 2, 11
○ C: 4, 13
○ D: 2, 16

3. If a, b, c, d, e, f are in arithmetic progression, then e - c = ?

○ A: $2(c - a)$
○ B: $2(d - c)$
○ C: $2(f - d)$
○ D: $d - c$

4. If a_{n-2} term of an AP is 3n-11. What is the nth term of the sequence?

○ A: $2n – 8$
○ B: $3n + 8$
○ C: $3n – 5$
○ D: $7n + 12$

5. If $|r| < 1$ then the sum of n terms of GP are given by?

○ A: $S_n = a_1 (1 + r^n) / (1 - r)$
○ B: $S_n = a_1 (1 - r)^n / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (1 - r^n) / (1 + r)$

6. **The first term of an A.P of consecutive numbers is $p^2 + 1$. The sum of $2p + 1$ terms of this series can be expressed as?**

○ A: $(p+1)^2$
○ B: $(p+1)^3$
○ C: $(2p +1) * (p+1)^2$
○ D: $p^3 + (p+1)^3$

7. The sum of first n terms of the series 1/2 + 3/4 + 7/8 + 15/16 + ... is equal to?

○ A: $2^n - n + 1$
○ B: $1 - 2^n$
○ C: $n + 2^{-n} – 1$
○ D: $2^n - 1$

8. The value of $0.4\overline{23}$ is

○ A: 419 / 999
○ B: 419 / 990
○ C: 423 / 1000
○ D: None of the above.

9. If $|r| > 1$ then the sum of n terms in a GP are given by formula?

○ A: $S_n = a_1 (r^n – 1) / (r + 1)$
○ B: $S_n = a_1 (r^n – 1) / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (r^n – 1) / (r - 1)$

10. Fine the 7th term of the series 2, 6, 11, 17, ...

○ A: 41
○ B: 47
○ C: 53
○ D: 62

11. Arithmetic mean between $3\sqrt{5}$ and $5\sqrt{5}$ is?

○ A: $4\sqrt{5}$ ○ B: $8\sqrt{5}$
○ C: $5\sqrt{15}$ ○ D: $15\sqrt{5}$

12. Harmonic mean between 3 and 7 is?

○ A: 7/3 ○ B: 3/7
○ C: 21/5 ○ D: 32/7

13. If k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an A.P, then k is equal to?

○ A: 0 ○ B: 1
○ C: 2 ○ D: 3

14. If sum of the series $1 + \frac{3}{x} + \frac{9}{x^2} + \frac{27}{x^3} + \dots \infty$ is a finite number, then

○ A: $x < 3$ ○ B: $x > 1/3$
○ C: $x < 1/3$ ○ D: $x > 3$

15. If G.P consists of even number of terms and sum of all terms is equal to 5 times the sum of terms in odd places (meaning term 1, 3, 5, ...) then common ratio will be?

○ A: 3 ○ B: 4
○ C: 5 ○ D: 6

16. If a series has common difference between two consecutive numbers. It is called?

○ A: Geometric progression ○ B: Arithmetric progression
○ C: Harmonic progression ○ D: None of the above.

17. Which term of the AP 92, 88, 84, 80 ... is zero?

○ A: 22 ○ B: 23
○ C: 24 ○ D: 34

18. The angles of a triangle are in A.P. If the least angle is 30^0 the greatest angle is?

○ A: 45^0 ○ B: 60^0
○ C: 75^0 ○ D: 90^0

19. If a, b, c are in A.P, b - a, c - b and a are in G.P, then a : b : c is ?

○ A: 1:2:3 ○ B: 1:4:9
○ C: 2:3:4 ○ D: 1:2:4

20. If n arithmetic means are added between 2 and 38 and the sum of resulting series is 200. Then the value of n is?

○ A: 6 ○ B: 8
○ C: 9 ○ D: 10

Probability & Permutations

TEST 1

1. If there are 3 roads from Lahore to Gujranwala and 4 roads from Gujranwala to Islamabad. How many different routes are there from Lahore to Islamabad?

○ A: 4
○ B: 10
○ C: 12
○ D: 18

2. If ${}^{n}C_{8} = {}^{n}C_{12}$, What is value of n?

○ A: 5
○ B: 10
○ C: 20
○ D: Cannot be determined.

3. If the probability to score a century in any given match is 0.04. How many centuries the batsmen would make in 50 matches?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

4. When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is?

○ A: 1/216
○ B: 8/27
○ C: 130/216
○ D: 125/216

5. A club has 20 members and you want to select the president and vice president for the club. How many different outcomes are possible if president and vice president cannot be the same person?

○ A: 370
○ B: 380
○ C: 390
○ D: 398

6. There are n points on a circle. The number of straight lines obtained by joining them is?

○ A: ${}^{n}C_{3}$
○ B: ${}^{n}C_{2}$
○ C: ${}^{n}C_{2} - n$
○ D: ${}^{n}C_{n}$

7. Probability of occurance for one of the four equally likely events would be?

○ A: 0
○ B: 0.25
○ C: 0.75
○ D: 1

8. What is the probability of getting a sum 9 from two throws of a dice?

○ A: 1/6
○ B: 1/8
○ C: 1/9
○ D: 1/12

9. The number of ways of painting the faces of a cube with six different colours is?

○ A: 1
○ B: 6
○ C: 6!
○ D: None of the above.

10. Which of the following is true?

$n! = n(n-1)!$, $0! = 0$, $4! = 4.3.2.1$

○ A: iii only
○ B: i and ii only
○ C: i and iii only
○ D: i, ii and iii

11. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

○ A: 5/7
○ B: 2/7
○ C: 3/5
○ D: 2/5

12. A husband and a wife appear in an interview for the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that none of them will be selected?

○ A: 12/35
○ B: 34/35
○ C: 24/35
○ D: None of the above.

13. If you role a dice twice. What is the probability that you would get 6 both the times?

○ A: 1/3
○ B: 1/6
○ C: 1/12
○ D: 1/36

14. If A and B are two independent sets then $P(A \cap B)$ = ?

○ A: $P(A) + P(B)$
○ B: $P(A) * P(B)$
○ C: $P(A) + P(B) – P(A \cup B)$
○ D: $P(A)$

15. The number of diagonals of a hexagon is?

○ A: 6
○ B: 9
○ C: 15
○ D: 18

16. The number of ways of selecting 2 candidates out of 5 equally qualified candidates for a post is?

○ A: 10
○ B: 8
○ C: 5
○ D: 20

17. P, Q, R and S are to give lectures to an audience. The organizer can arrange the order of their presentations in how many ways?

○ A: 4
○ B: 8
○ C: 12
○ D: 24

18. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: $(p+q)!$
○ B: $(p+q)! / p!$
○ C: $(p+q)! / q!$
○ D: $(p+q)! / p!q!$

19. A set with all possible outcomes of an experiment is called?

○ A: Probability function
○ B: Event space
○ C: Sample space
○ D: Both B and C.

20. $9! / (6!3!)$ = ?

○ A: 72
○ B: 84
○ C: 96
○ D: 108

TEST 2

1. The total number of different combinations of names which can be made from the letters of the word MISSISSIPPI, using all the letters at a time?

○ A: 4!x 4!x 2! ○ B: 11! / (4!x 4!x 2!)

○ C: 11! / (10!) ○ D: 11!

2. A work is given to 3 men and their probabilities for doing the work are 1/7, 1/4, 1/6 respectively. Find the probability that the work is done?

○ A: 39/84 ○ B: 1/168

○ C: 167/168 ○ D: 23/89

3. Three identical dice are rolled. The probability that the same number will appear on each of them is?

○ A: 1/6 ○ B: 1/36

○ C: 1/216 ○ D: 3/216

4. The number of subsets of a set containing n distinct objects is?

○ A: ${}^{n}C_1 + {}^{n}C_2 + {}^{n}C_3 + \dots\dots + {}^{n}C_n$ ○ B: ${}^{n}C_0 + {}^{n}C_1 + {}^{n}C_2 + \dots\dots + {}^{n}C_n$

○ C: $2^n + 1$ ○ D: None of the above.

5. The odds against drawing 2 red balls from a bag containing 3 red and 2 white balls is?

○ A: 1 : 2 ○ B: 3 : 7

○ C: 7 : 3 ○ D: 3 : 2

6. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that either Hafeez or Afridi would face the first ball?

○ A: 2/11 ○ B: 1/11

○ C: 1/121 ○ D: 1/110

7. There are 8 persons in the room. 4 are men and 4 are women. If two persons are selected, what is the probability that both of them would be men?

○ A: ½ ○ B: 1/4

○ C: 3/7 ○ D: 3/14

8. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is?

○ A: 21/46 ○ B: 25/117

○ C: 1/50 ○ D: 3/23

9. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that neither Hafeez nor Afridi would face the first ball?

○ A: 2/11 ○ B: 1/11

○ C: 9/11 ○ D: 10/11

10. An rack has 5 black and 4 white ties. A boy pulls out 2 ties at random. The probability that 2 are of the same colour is?

○ A: 4/9 ○ B: 5/9

○ C: 5/8 ○ D: 3/8

11. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

○ A: 1/14 ○ B: 1/8

○ C: ¾ ○ D: 4/7

12. For any two events A and B, $P(A \cap B)$ is?

○ A: Less than $P(A) + P(B) – 1$ ○ B: Greater than $P(A) + P(B)$

○ C: $P(A) + P(B) - P(A \cup B)$ ○ D: $P(A) + P(B) + P(A \cup B)$

13. The probability that a man will live 10 more years is 1/4 and the probability that his wife will live 10 more years is 1/3. The probability that neither of them will be alive in 10 years is?

○ A: 1/12 ○ B: 11/12

○ C: 7/12 ○ D: 1/2

14. A box contains 2 white, 3 black and 4 red balls. The number of ways in which 3 balls can be drawn from the box, so that at least one of the balls is black is?

○ A: 45 ○ B: 84

○ C: 64 ○ D: 32

15. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

○ A: 10/21 ○ B: 11/21

○ C: 2/7 ○ D: 5/7

16. The chances of wining of two race horses are 1/3 and 1/6 respectively. What is the probability that atleast one will win, when the horses are running in different races?

○ A: ½ ○ B: 1/8

○ C: 1/18 ○ D: 4/9

17. How many signal can be made with 4 signs using any number of signs at a time?

○ A: 24 ○ B: 60

○ C: 64 ○ D: 82

18. How many words can be formed by taking four different letters of the word MATHEMATICS?

○ A: 7920 ○ B: 1680

○ C: 1260 ○ D: 68

19. $^{n}P_{r}$ = ?

○ A: $^{n}C_{r} * r!$ ○ B: $^{n}C_{n-r} * r!$

○ C: $^{n}C_{n-r}$ ○ D: Both A and B.

20. If the probability that a batsmen scores a century in any given match is 0.3. On average how many matches the batsmen would play to score his first century?

○ A: 2 ○ B: 4

○ C: 15 ○ D: 30

TEST 3

1. **A matrix is chosen at random from the set of all 2 x 2 matrices with elements 0 and 1 only. The probability that the value of the determinant of the matrix chosen is positive is?**

   ○ A: 1/8 ○ B: 3/16

   ○ C: 1/16 ○ D: 13/16

2. **Six identical coins are arranged in a row. The number of ways, in which the number of tails is equal to the number of heads is?**

   ○ A: 20 ○ B: 24

   ○ C: 36 ○ D: 48

3. **3 books of english and 5 books of urdu are randomly placed on a shelve. What is the probability that books on the same subject are together?**

   ○ A: 1/56 ○ B: 1/7

   ○ C: 2/8! ○ D: 1/28

4. **When a dice is rolled probability that even number or number greater than 4 appear is?**

   ○ A: 5/6 ○ B: 1/6

   ○ C: 2/3 ○ D: 1/3

5. **There are 10 lamps of different colors in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is?**

   ○ A: 1025 ○ B: 1024

   ○ C: 1023 ○ D: 10!

6. **Eight chairs are numbered 1 to 8. 2 women and 3 men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is?**

   ○ A: ${}^4C_3 . {}^4C_2$ ○ B: ${}^4C_2 . {}^4P_2$

   ○ C: ${}^4P_2 . {}^4P_3$ ○ D: ${}^4P_2 . {}^6P_3$

7. **Find the number of ways in which a mixed double tennis game can be arranged between 10 players consisting of 6 men and 4 women?**

   ○ A: 190 ○ B: 180

   ○ C: 90 ○ D: 48

8. **There are 18 children in the room including 9 boys and 9 girls. You call a child to give a sweet and the child goes back to the room and can potentially be chosen again. If total number of sweets are 4, what is the probability that atleast one boy gets the sweet?**

   ○ A: 1/16 ○ B: 15/16

   ○ C: 9/16 ○ D: 7/18

9. **If five digit numbers are formed from 1,2,3,4,8. What is the probability of forming a number with 2 and 8 not next to each other?**

   ○ A: 2/5 ○ B: 2/7

   ○ C: 5/7 ○ D: 3/5

10. **In how many ways 8 books including 2 English books can be arranged together such that English books are not together?**

    ○ A: 5040 ○ B: 10080

    ○ C: 30240 ○ D: 40320

A person wishes to make up as many different parties as he can out of his 20 friends, such that each party consists of the same number of persons. The number of friends he should invite at a time is?

○ A: 5 ○ B: 8
○ C: 10 ○ D: 12

11. Pakistan plays two matches each with West Indies and Australia. In any match, the probabilities of Pakistan getting points 0, 1 and 2 are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of Pakistan getting at least 7 points is?

○ A: 0.8750 ○ B: 0.0875
○ C: 0.0625 ○ D: 0.0250

12. In how many ways 5 boys and 4 girls can be seated in a bench such that boys and girls occupy alternate seats?

○ A: 1240 ○ B: 1560
○ C: 2590 ○ D: 2880

13. A man invites 4 men and 4 women to a party. In how many ways can they sit around a round table, so that no two men are together?

○ A: 6 ○ B: 24
○ C: 132 ○ D: 144

14. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:?

○ A: 3/22 ○ B: 1/22
○ C: 2/91 ○ D: 3/91

15. Two different numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is? Hint: $a^2 - b^2$ is divisible by 3 if both the numbers are divisible by 3 or none of them is divisible by 3.

○ A: 2/87 ○ B: 19/87
○ C: 37/87 ○ D: 47/87

16. $^{13}C_9 - {}^{12}C_8$ is equal to?

○ A: $^{13}C_7$ ○ B: $^{13}C_9$
○ C: $^{12}C_9$ ○ D: None of the above.

17. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 points lying on them respectively. The number of triangles that can be constructed using these points as vertices is?

○ A: 205 ○ B: 208
○ C: 220 ○ D: 260

18. If A and B are two events, such that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\overline{B}) = 1/2$, then the events A and B are?

○ A: Independent ○ B: Dependent
○ C: Disjoint ○ D: None of the above.

19. How many necklaces can be made from 6 beads of different colors?

○ A: 60 ○ B: 120
○ C: 360 ○ D: 720

TEST 4

1. **A carton contains 20 bulbs, out of which 5 are defective. If a sample of 3 bulbs is selected at random, find the probability that 2 of them are defective bulbs?**

○ A: 1/16 ○ B: 3/64

○ C: 9/64 ○ D: 2/64

2. **The number of ways in which 12 balls can be divided between two friends, one receiving 8 and the other 4 is?**

○ A: 12! / 8!4! ○ B: 12!2! / 8!4!

○ C: 12! / 8!4!2! ○ D: 8!4!

3. **The probability that A can solve a problem is 2/3 and the probability that B can solve the problem is 3/4. The probability that at least one of A and B will be able to solve the problem is?**

○ A: 11/12 ○ B: 5/12

○ C: 1/12 ○ D: 1/2

4. **Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 1 heads after six tosses?**

○ A: 0.08 ○ B: 0.17

○ C: 0.30 ○ D: 0.44

5. **How many 5 digit number divisible by 2 can be formed from 1,2,3,5,7?**

○ A: 24 ○ B: 48

○ C: 124 ○ D: 132

6. **Out of 40 consecutive integers, two are chosen at random. The probability that their sum is odd is?**

○ A: 1/200 ○ B: 1/2

○ C: 20/39 ○ D: 1/20

7. **Cards are drawn one by one at random from a well shuffled pack of 52 cards. What is the probability that there is only one ace in first 17 cards?**

○ A: $({}^{4}C_{1} * {}^{48}C_{16}) / {}^{52}C_{17}$ ○ B: ${}^{48}C_{16} / {}^{52}C_{17}$

○ C: $({}^{4}C_{1} + {}^{48}C_{16}) / {}^{52}C_{17}$ ○ D: ${}^{4}C_{1} / {}^{52}C_{17}$

8. ***H.C.F of n !, (n + 1) ! and (n + 2) ! is?***

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: None of the above.

9. **The number of arrangements which can be made using all the letters of the word LAUGH, if the vowels are adjacent is?**

○ A: 120 ○ B: 24

○ C: 48 ○ D: 56

10. **On the occasion of Eid festival, each student of a class sends greeting cards to others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is?**

○ A: ${}^{20}C_{2}$ ○ B: $2 \times {}^{20}C_{2}$

○ C: $2\ {}^{20}P_{2} - 1$ ○ D: None of the above.

11. **There are 4 letter boxes in a post office. In how many ways can a man post 8 different letters?**

○ A: 4^{8} ○ B: 8^{4}

○ C: 8! ○ D: 4!

12. 5 men and 6 women have to be seated in a straight row, so that no two women are together. Find the number of ways in which this can be done?

○ A: 43200
○ B: 39600
○ C: 36000
○ D: 86400

13. The number of ways in which 5 beads of different colours can form a necklace is?

○ A: 6
○ B: 12
○ C: 24
○ D: 60

14. L.C.M. of n !, (n + 1) ! and (n + 2) ! is?

○ A: n!
○ B: (n+1)!
○ C: (n+2)!
○ D: n

15. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

○ A: ¾
○ B: 1/3
○ C: 7/19
○ D: 9/21

16. ^nP_n = ?

○ A: ^nC_n
○ B: $^{n+1}C_n$
○ C: n
○ D: n!

17. Everybody in a room shakes hand with every other person. The total number of hand shakes is 66. Find the total number of persons in the room?

○ A: 9
○ B: 10
○ C: 11
○ D: 12

18. A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 1/3, 1/4 respectively. What is the probability that the problem will be solved?

○ A: ¼
○ B: 1/24
○ C: 7/24
○ D: 3/4

19. The number of ways in which a mixed double game can be arranged from among nine married couples, if no husband and wife play in the same game is?

○ A: 1512
○ B: 756
○ C: 3024
○ D: 3298

20. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: C(p + q, q)
○ B: P(p + q, p)
○ C: P(p + q, q)
○ D: C(p + q, p - q)

21. If you toss four coins, what is the probability of getting two heads and two tails?

○ A: 3/16
○ B: 1/8
○ C: 2/8
○ D: 3/8

22. When three dice are thrown, what is the probability of getting the same number on three of them?

○ A: 1/216
○ B: 1/36
○ C: 5/36
○ D: 1/6

23. The number of digits that can be formed from 2, 3, 5, 7, 8 with 2 and 8 next to each other is?

○ A: 24
○ B: 36
○ C: 48
○ D: 72

24. An employer wants to hire 3 analysts from 6 applicants and 2 designers from 4 applicants. What is the total number of ways in which she can make the selection?

○ A: 1490
○ B: 132
○ C: 120
○ D: 60

25. If ${}^{n}C_{r-1} = 36$, ${}^{n}C_{r} = 84$ and ${}^{n}C_{r+1} = 126$, then r is equal to?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

26. Four cars are racing in a circuit. What are the total number of permutations with which they can cross the finish line?

○ A: 4
○ B: 16
○ C: 18
○ D: 24

27. The probability that the 1st day of a random chosen month is a Friday is?

○ A: 1/7
○ B: 1/12
○ C: 1/19
○ D: 1/84

28. m parallel lines in a plane are intersected by a family of n parallel lines. The total number of parallelograms so formed is?

○ A: (m-1)(n-1) / 4
○ B: mn/4
○ C: m(m-1)(n-1)/2
○ D: mn(m-1)(n-1)/4

29. There are 10 girls and 20 boys in a class. 5 girls and 10 boys have blue eyes. Find the probability that one student chosen at random is a girl and has blue eyes?

○ A: 2/3
○ B: 5/6
○ C: 1/6
○ D: 1/2

30. If $P(A \cup B) \neq P(A) + P(B)$ Then;

○ A: A and B are disjoint sets.
○ B: A and B are Independent sets
○ C: A and B are overlapping sets
○ D: A and B are unit event sets.

31. From a set of 17 cards numbered 1 to 17, one card is drawn at random. The probability that the number is divisible by 3 or 7 is?

○ A: 2/17
○ B: 5/17
○ C: 7/17
○ D: 9/17

32. The number of times the digit 3 will appear listing the integers from 1 to 1000 is?

○ A: 271
○ B: 280
○ C: 297
○ D: 300

33. Three unbiased coins are tossed. What is the probability of getting atleast one head?

○ A: ¾
○ B: 1/4
○ C: 1/8
○ D: 7/8

Induction & Binomial Theorem

TEST 1

1. **Which of the following is not true regarding the binomial expansion of $(a + x)^n$?**

○ A: Total number of terms is n + 1.

○ B: Sum of exponents of a and x in each term of expansion is equal to n.

○ C: Exponent of a decrease from n to n - 1.

○ D: Exponent of x increase from 0 to n.

2. **What is the coefficient of the third term for $(x + y)^5$?**

○ A: 2 ○ B: 5

○ C: 8 ○ D: 10

3. **What is the general term of $(x + 2/x)^4$?**

○ A: $C(4,k)\ 2^k\ x^{4-2k}$ ○ B: $C(4,k)\ 2^k\ x^{2-2k}$

○ C: $C(4,k)\ 2^k\ x^{4-k}$ ○ D: $C(4,k)\ 2^{2k}\ x^{2-2k}$

4. **$(x+y)^4 = ?$**

○ A: $x^4 + 2x^3y + 4x^2y^2 + 2xy^3 + y^4$ ○ B: $x^4 + 4x^3y + 6x^2y^2 + 2xy^3 + y^4$

○ C: $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$ ○ D: $x^4 + 4x^3y + 8x^2y^2 + 4xy^3 + y^4$

5. **If n is odd, the middle term in the expansion of $(a + x)^n$ is?**

○ A: n/2 + 1 ○ B: n/2 and n/2 + 1

○ C: (n + 1) / 2 and (n + 2) / 2 ○ D: (n + 1) / 2 and (n + 3) / 2

TEST 2

1. The method of mathematical induction was devised by?

○ A: David Hilbert
○ B: Francesco Mourolico
○ C: Issac Newton
○ D: Carl F. Gauss

2. What is the 3rd term in the binomial expansion of

3. $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^6$

○ A: -20
○ B: 20
○ C: 15 a/x
○ D: 15 x/a

4. Third term in the expansion of $(1 - x)^{-1}$ is?

○ A: x^2
○ B: $2x^2$
○ C: $-x^2$
○ D: $-2x^2$

5. Which of the following would have even number of terms in its expansion?

○ A: $(a + x)^{20}$
○ B: $(a + x)^{90}$
○ C: $(a + x)^{51}$
○ D: Both A and B.

6. What is the value of $(0.97)^6$ using only the first three terms of binomial expansion?

○ A: 0.8246
○ B: 0.8318
○ C: 0.8335
○ D: 0.8452

7. How many terms are there in the expansion of $(a + x)^{100}$

○ A: 99
○ B: 100
○ C: 101
○ D: Cannot determine.

8. What is the middle term in the expansion of $(4x – y)^8$?

○ A: $19240\ x^4y^4$
○ B: $17920\ x^4y^4$
○ C: $56220\ x^2y^2$
○ D: $18420\ x^4y^4$

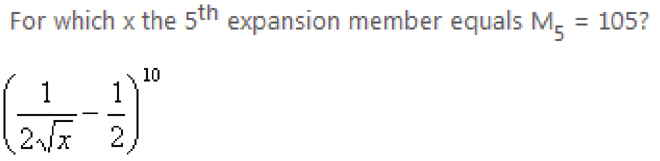
9. What is the contant term in the expansion of $(1/z^3 + z^2)^5$?

○ A: 10
○ B: 16
○ C: 18
○ D: 24

10. What is the fourth term in the expansion of $(1 - x)^{1/2}$?

○ A: - ¼
○ B: - 1/2 x
○ C: $-1/8\ x^2$
○ D: $- 1/16\ x^3$

TEST 3

1. 
For which x the 5th expansion member equals $M_5 = 105$?

$$\left(\frac{1}{2\sqrt{x}} - \frac{1}{2}\right)^{10}$$

○ A: ½
○ B: 1/4
○ C: 1/8
○ D: 2

2. If x is the sum of the odd coefficients and y is the sum of the even coefficients in a binomial expansion. Then?

○ A: $x = y/2$
○ B: $x = y$
○ C: $x = 2y$
○ D: None of the above.

3. The rule of binomial expansion for $(a + x)^n$ is valid if?

○ A: a and x both are real numbers.
○ B: a is real and x can be real or complex.
○ C: x is real and a can be real or complex.
○ D: Both a and x can be real or complex.

4. Find out the member of the binomial expansion of $(x + x^{-1})^8$ not containing x?

○ A: 7th
○ B: 6th
○ C: 5th
○ D: 4th

5. If in the expansion of $(x + y^3)^n$ the coefficient of the 3rd term is greater by 44 than the 2nd term. The value of n is?

○ A: 8
○ B: 9
○ C: 10
○ D: 11

6. Which term in the expansion of $(x - 2/x^2)^{13}$ has term x^{-2} ?

○ A: 5th
○ B: 6th
○ C: 7th
○ D: 8th

7. The sum of coefficients in the binomial expansion is equal to?

○ A: 2^n
○ B: 2^{2n}
○ C: 2^{2n-1}
○ D: 2^{n-1}

8. What is the middle term in the expansion of $(x + 1/x)^{2n}$? Where $x \neq 0$.

○ A: C(2n,n)
○ B: C(2n,n) x
○ C: C(2n,n) x^{2n}
○ D: C(2n,n) x^{3n}

9. What is the constant term in the expansion of $(x^2 - 2/x^2)^8$?

○ A: 1080
○ B: 1120
○ C: 2400
○ D: 2480

10. Which member of the binomial expansion of $(2x^3 + x^{-1})^{10}$ contains x^6?

○ A: 6th
○ B: 7th
○ C: 8th
○ D: 9th

11. What is the term containing x^{14} in the expansion of $(x^3 - 1/x^2)^{13}$?

○ A: C(13,7) $12x^{14}$
○ B: -C(13,6) $10x^{14}$
○ C: -C(13,5) x^{14}
○ D: C(13,8) $4x^{14}$

Trigonometry

TEST 1

1. **235° expressed in radians is?**

○ A: $\pi / 235$ ○ B: $85\pi / 49$
○ C: $47\pi / 36$ ○ D: $235/\pi$

2. **1/2 rotation anti-clockwise is called?**

○ A: Right angle ○ B: Straight Angle
○ C: Circle ○ D: None of the above.

3. If $5\sin\theta = 3$, $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to

○ A: ½ ○ B: 1
○ C: 2 ○ D: 4

4. **If $\cos 3\theta = \sqrt{3}/2$; $0 < \theta < 20^o$ then the value of θ is?**

○ A: 0° ○ B: 5°
○ C: 10° ○ D: 15°

5. **If $\sec\theta - \tan\theta = 1/2$ then $\sec\theta + \tan\theta = ?$**

○ A: 1 ○ B: 2
○ C: 3 ○ D: 4

6. **cos A - cos B = ?**

○ A: 2 cos (A+B)/2 cos (A-B)/2 ○ B: 2 cos (A+B)/2 sin (A-B)/2
○ C: 2 sin (A+B)/2 cos (A-B)/2 ○ D: -2 sin (A+B)/2 sin (A-B)/2

7. **Which of the following is not ture?**

○ A: $\cot(-\theta) = -\cot\theta$ ○ B: $\cos(-\theta) = \cos\theta$
○ C: $\sin(-\theta) = -\sin\theta$ ○ D: $\tan(-\theta) = \tan(\theta)$

8. **$\sin 30^0 + \cos 60^0 + \tan 45^0$ is equal to?**

○ A: 1 ○ B: 2
○ C: 3 ○ D: 4

9. **In sexagesimal system angle is represented in?**

○ A: Degrees ○ B: Degrees, Minutes and Seconds
○ C: Radians ○ D: Mircro radians.

10. **If $\sin\theta = \cos\theta$ then $\theta = ?$**

○ A: 30° ○ B: 45°
○ C: 60° ○ D: 75°

11. **If the length of arc is twice the radius of the circle. Then angle subtended at the center is?**

○ A: 1 radian ○ B: 2 radian
○ C: $\pi/3$ radian ○ D: $\pi/4$ radian

12. What is the period of tan 4x?

○ A: π ○ B: π/3

○ C: π/4 ○ D: π/8

13. tan^2 x - sin^2 x is equal to?

○ A: tan^2 x cosec^2 x ○ B: sin^2 x cot^2 x

○ C: sec^2 x cosec^2 x ○ D: tan^2 x sin^2 x

14. tan 225° =?

○ A: 0 ○ B: 1

○ C: √3 ○ D: 1/√3

15. tan (2π - θ) = ?

○ A: tan θ ○ B: - tan θ

○ C: cot θ ○ D: - cot θ

16. If cos A = 1/√2 and sin B = 1/2 then A+B = ?

○ A: 60° ○ B: 75°

○ C: 90° ○ D: 120°

17. 1° = ?

○ A: 0.0125 radian ○ B: 0.0175 radian

○ C: 0.0225 radian ○ D: 0.0275 radian

18. 35° 20' in radians is?

○ A: 28π / 220 ○ B: 53π / 45

○ C: 53π / 290 ○ D: 53π / 270

19. cos (π + θ) = ?

○ A: sin θ ○ B: - sin θ

○ C: cos θ ○ D: - cos θ

20. If A = B = 60°. Then $\frac{cscA + cotB}{secA * tanB}$ **= ?**

○ A: 0 ○ B: 1

○ C: ½ ○ D: 1/√2

TEST 2

1. Which of the following relations is possible?

○ A: sec θ = 2/3 ○ B: sin θ = 4/3

○ C: tan θ = 2014 ○ D: cos θ = (1+t^2) / (1-t^2)

2. sec (-960°) = ?

○ A: 2 ○ B: √2

○ C: -√2 ○ D: -2

3. cos 2α = ?

○ A: sin α cos α ○ B: 2 sin α cos α

○ C: cos^2 α - sin^{2}α ○ D: cos^2 α + sin^{2}α

4. If α, β and γ are the angles of a triangle then sin (α + β) = ?

○ A: sin γ
○ B: cos γ
○ C: - sin γ
○ D: - cos γ

5. $\sin(-625^\circ) = ?$

○ A: $\sin 5^\circ$
○ B: $\cos 5^\circ$
○ C: $\sin 15^\circ$
○ D: $\cos 15^\circ$

6. Converting 21.256° to DMS gives?

○ A: $21^\circ\ 15.36'$
○ B: $21^\circ\ 18'\ 32''$
○ C: $21^\circ\ 15'\ 22''$
○ D: $21^\circ\ 15'\ 28''$

7. If sin (A + B + C) = 1, tan (A - B) = 1/√3, and sec(A + C) = 2, then?

○ A: $A = 120^\circ$, $B = 60^\circ$ and $C = 0^\circ$
○ B: $A = 60^\circ$, $B = 30^\circ$ and $C = 0^\circ$
○ C: $A = 60^\circ$, $B = 60^\circ$ and $C = 60^\circ$
○ D: $A = 90^\circ$, $B = 60^\circ$ and $C = 30^\circ$

8. sin A + sin B = ?

○ A: -2 sin (A+B)/2 sin (A-B)/2
○ B: 2 cos (A+B)/2 cos (A-B)/2
○ C: 2 sin (A+B)/2 cos (A-B)/2
○ D: 2 cos (A+B)/2 sin (A-B)/2

9. The value of $\tan 15^\circ + \cot 15^\circ$ is ?

○ A: 1
○ B: √3
○ C: √3/2
○ D: 4

10. The period of the function f(x) =cos 4x is?

○ A: π
○ B: 2π
○ C: π/2
○ D: 3π/2

11. If $x = \sin^2 \theta \cos \theta$ and $y = \cos^2 \theta \sin \theta$ then $\sin \theta = ?$

○ A: x^2 / y
○ B: y^2 / x
○ C: $(y^2 / x)^{1/3}$
○ D: $(x^2 / y)^{1/3}$

12. What is the period of cot x/7 ?

○ A: 7π
○ B: 2π/7
○ C: π/7
○ D: π/14

13. If cot θ = sin 2θ, then θ is equal to?

○ A: 45° and 90°
○ B: 45° and 90°
○ C: 90° and 60°
○ D: 60° and 30°

14. The value of $\cos^2 15^\circ - \cos^2 30^\circ + \cos^2 45^\circ - \cos^2 60^\circ + \cos^2 75^\circ$ is?

○ A: 1
○ B: 1/2
○ C: 3/2
○ D: 2

15. If tan θ = 8/15 then what is the value of sec θ for θ lying in the quadrant III?

○ A: 15/17
○ B: -15/17
○ C: 17/15
○ D: - 17/15

16. The largest value of sinθ x cosθ is?

○ A: 1
○ B: 1/2
○ C: 1/√2
○ D: 1/√3

17. $(1 + \sec\theta)(1 - \cos\theta) = ?$

○ A: $\sin\theta$
○ B: $\cot\theta$
○ C: $\cot\theta\cos\theta$
○ D: $\tan\theta\sin\theta$

18. $\sec(-7\pi/4) = ?$

○ A: $\sqrt{2}$
○ B: $-\sqrt{2}$
○ C: $2/\sqrt{3}$
○ D: $-2/\sqrt{3}$

19. If the length of a chord of a circle is equal to the radius of that circle, the angle subtended (in radians) at the centre of the circle by the chord is?

○ A: 1
○ B: $\pi/2$
○ C: $\pi/3$
○ D: $\pi/6$

20. The value of $\cos 1° * \cos 2° * \cos 3° \ldots\ldots \cos 179°$ is ?

○ A: 0
○ B: 1
○ C: 2
○ D: -1

TEST 3

1. The perimeter of a certain sector of a circle is equal to half that of the circle of which it is a part. The circular measure of the angle of the sector is?

○ A: π
○ B: $\pi - 2$
○ C: $2\pi/3$
○ D: $\pi - 4$

2. $\tan 3x - \tan 2x - \tan x$ is equal to?

○ A: $\tan x / (\tan 2x * \tan 3x)$
○ B: $(\tan x)^3$
○ C: $(\tan 3x + \tan 2x + \tan x) - (\tan x * \tan 2x)$
○ D: $\tan x * \tan 2x * \tan 3x$

3. $\sin 75^o = ?$

○ A: $\frac{\sqrt{2}(\sqrt{3}+1)}{4}$
○ B: $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$
○ C: $\sqrt{3}/4$
○ D: $-\sqrt{3}/4$

4. The equation $\sin x \cos x = 2$ has?

○ A: One solution
○ B: Two solutions
○ C: Infinite solutions.
○ D: No solution.

5. $\cos(x+y)\sin(x-y) = ?$

○ A: $1/2 (\sin 2x - \sin 2y)$
○ B: $1/2 (\sin 2y - \sin 2x)$
○ C: $\sin 2x - \sin 2y$
○ D: $\sin 2x + \sin 2y$

6. $\tan(294^o) = ?$

○ A: $\cot 32^o$
○ B: $-\cot 32^o$
○ C: $-\cot 24^o$
○ D: $\cot 24^o$

7. If $\sin A + \sin B = x$ and $\cos A + \cos B = y$, $\cos(A - B)$ is equal to ?

○ A: $x^2 + y^2 - 2$
○ B: $(x^2 + y^2 - 2) / 2$
○ C: $(2 - x^2 + y^2) / 2$
○ D: $(2 - x^2 - y^2) / 2$

8. Period of cot (3x) - sin (4x) is?

○ A: πq　○ B: π/2

○ C: π/3　○ D: π/4

9. $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = ?$

○ A: 1　○ B: 2

○ C: tan 2θ　○ D: cot 2θ

10. (1 - cos α) / sin α = ?

○ A: cos α/2　○ B: sin α/2

○ C: sec α/2　○ D: tan α/2

11. 8 sin x/8 cos x/2 cos x/4 cos x/8 = ?

○ A: 4 sin x　○ B: sin x

○ C: cos x　○ D: 8 cos x

12. What is the domain of $\sqrt{\sin^{-1} 2x + \pi/6}$ **?**

○ A: [1/4 , 1/2]　○ B: [-1/4 , 1/2]

○ C: [1/8 , 1/2]　○ D: [-1/8 , 1/2]

13. $\cos 12^{o} + \cos 48^{o} = ?$

○ A: $2 \cos 30^{o} \cos 18^{o}$　○ B: $- 2 \cos 30^{o} \cos 18^{o}$

○ C: $2 \cos 30^{o} \sin 18^{o}$　○ D: $- 2 \cos 30^{o} \sin 18^{o}$

14. If $(x \sin^3 \alpha + y \cos^3 \alpha) = \sin \alpha \cos \alpha$ **and** $(x \sin \alpha - y \cos \alpha = 0)$**, then** $x^2 + y^2 = ?$

○ A: 0　○ B: 2

○ C: -1　○ D: 1

15. If $\sin^2\theta + 3 \cos\theta - 2 = 0$**,** $\cos^3\theta + \sec^3\theta$ **is equal to?**

○ A: 18　○ B: 9

○ C: 6　○ D: 3

16. The value of $\tan 1^{o} * \tan 2^{o} * \tan 3^{o} \ldots\ldots \tan 89^{o} = ?$

○ A: 0　○ B: 1

○ C: -1　○ D: 1/2

17. If cos (A - B) = 3/5 and tan A . tan B = 2 then ?

○ A: cos A cos B = 1/5　○ B: sin A sin B = -2/5

○ C: cos (A + B) = 1/5　○ D: sin A sin B =4/5

18. sin 2α / (1 + cos 2α) = ?

○ A: cot α　○ B: tan α

○ C: sec α　○ D: csc α

19. Find the value of $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$

○ A: tan 3θ　○ B: cot 3θ

○ C: tan 6θ　○ D: cot 6θ

20. $\frac{tan\ \alpha + tan\ \beta}{tan\ \alpha - tan\ \beta} = ?$

○ A: sin (α + β) / sin (α - β) ○ B: sin (α - β) / sin (α + β)
○ C: cot (α + β) ○ D: sin α / sin (α - β)

TEST 4

1. tan (15°) = ?

○ A: (√3 + 1) / (√3 - 1) ○ B: (√3 - 1) / (√3 + 1)
○ C: √3 / (√3 + 1) ○ D: 1/3√3

2. The bottom of a pendulum describes an arc 3 ft long when the pendulum swings through an angle of 1/5 radian. The length of the pendulum in feet is ?

○ A: 15 ft ○ B: 12 ft
○ C: 5/3 ft ○ D: 3/5 ft

3. tan (π/4 + θ) tan (3π/4 + θ) is equal to ?

○ A: 0 ○ B: 1
○ C: -1 ○ D: 2

4. If tan 2 A = cot (A - 18°), then the value of A is?

○ A: 18° ○ B: 24°
○ C: 27° ○ D: 36°

5. What is the period of sec 9x ?

○ A: π ○ B: 2π/9
○ C: π/9 ○ D: π/18

6. If cot θ > 0 and sin θ < 0 then θ lies in the ?

○ A: Quadrant I ○ B: Quadrant II
○ C: Quadrant III ○ D: Quadrant IV

7. If α, β and γ are the angles of a triangle then tan (α + β) - tan γ = ?

○ A: 2 tan γ ○ B: - 2 tan γ
○ C: 0 ○ D: 1

8. 1 radian = ?

○ A: 60° ○ B: 59°
○ C: 58° ○ D: 57°

9. 6'' in radians = ?

○ A: π / 216000 radians ○ B: π / 108000 radians
○ C: π / 648000 radians ○ D: π / 3600 radians

10. The radius of a circle is 8 in. Find the angle in radians that an arc of 1 ft subtends in the center of this circle?

○ A: 1/8 ○ B: 2/8
○ C: 3/2 ○ D: π/6

11. In a triangle ABC, A = 45°, then the value of (1 + cot B) (1 + cot C) is equal to ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

12. If $\tan \theta = -4/3$, $\sin \theta$ = ?

○ A: -4/5 but not 4/5 ○ B: 4/5 but not -4/5

○ C: 4/5 or - 4/5 ○ D: Undefined.

13. Which of the following is true for $0^o \leq \theta < 90^o$?

○ A: $1/\sec \theta > 1$ ○ B: $1/\text{cosec } \theta < 1$

○ C: $\sec \theta = 0$ ○ D: $1/\cos \theta < 1$

14. Which of the following is true about θ in the quadrant II?

csc θ is positive, cos θ is positive, tan θ is positive

○ A: i only ○ B: i and ii only

○ C: ii and iii only ○ D: None of them is true

15. Domain of csc θ is θ Є R except θ = ?

○ A: nπ where n Є Z ○ B: [(2n+1)/2] π where n Є Z

○ C: nπ/2 where n Є Z ○ D: (2n+1/2)π where n Є Z

16. If $\sec \theta + \tan \theta = x$ then $\tan \theta$ = ?

○ A: $(x^2 - 1) / x$ ○ B: $(x^2 + 1) / x$

○ C: $(x^2 + 1) / 2x$ ○ D: $(x^2 - 1) / 2x$

17. Which of the following is not possible?

○ A: $\sin \theta = ¾$ ○ B: $\tan \theta = 75$

○ C: $\text{cosec } \theta = 5/3$ ○ D: $\cos \theta = (1 + t^2) / (1 - t^2)$

18. The value of $\sin^2 \pi/8 + \sin^2 3\pi/8 + \sin^2 5\pi/8 + \sin^2 7\pi/8$ is?

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

19. If tan A = 1/2, then tan 2A is equal to?

○ A: 1 ○ B: 1/2

○ C: 4/3 ○ D: 5/4

20. If A = B = C = 60° then $\frac{tanA + tanB + tanC}{tanA * tanB * tanC}$ = ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: √3

Inverse Trigonometric Function

TEST 1

1. **Which of the following is true?**

$\sin^{-1} x = (\sin x)^{-1,}$ $\cos^{-1} x = (\cos x)^{-1,}$ $\tan^{-1} x = (\cot x)^{-1}$

○ A: i and ii only
○ B: ii only
○ C: i, ii and iii
○ D: None of them is true.

2. **$\cos^{-1} A + \cos^{-1} B$ = ?**

○ A: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ D: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$

3. **Principal value of $\sin^{-1}(-\sqrt{3}/2)$ = ?**

○ A: $-2\pi/3$
○ B: $-\pi/3$
○ C: $\pi/3$
○ D: $2\pi/3$

4. **Range of $y = \sin^{-1} x$ is?**

○ A: $-\pi/2 \leq y \leq \pi/2$
○ B: $-\pi \leq y \leq \pi$
○ C: $-\pi/4 \leq y \leq \pi/4$
○ D: $-1 \leq y \leq 1$

The value of $\tan^{-1}(-1/\sqrt{3})$ is?

○ A: $\pi/3$
○ B: $-\pi/4$
○ C: $3\pi/4$
○ D: $-\pi/6$

5. **What is the value of $\tan^{-1} 3/4 + \tan^{-1} 5/12$?**

○ A: $\tan^{-1} 56/33$
○ B: $\tan^{-1} 16/33$
○ C: $\tan^{-1} 15/48$
○ D: $\tan^{-1} 16/63$

6. **$y = \tan x$ is called principal tangent function if ?**

○ A: - infinity < x < infinity
○ B: $-\pi < x < \pi$
○ C: $-\pi/2 < x < \pi/2$
○ D: $0 < x < \pi$

7. **$\cos^{-1}(-1/2)$ = ?**

○ A: $\pi/3$
○ B: $-2\pi/3$
○ C: $2\pi/3$
○ D: Both B and C.

8. **Range of $y = \cos^{-1} x$ is?**

○ A: $-\pi/2 \leq y \leq \pi/2$
○ B: $-\pi \leq y \leq \pi$
○ C: $0 \leq y \leq \pi/2$
○ D: $0 \leq y \leq \pi$

9. **$2 \tan^{-1} A$ = ?**

○ A: $\tan^{-1} 2A / (1 + A^2)$
○ B: $\tan^{-1} 2A / (1 - A^2)$
○ C: $\tan^{-1} A / (1 + A^2)$
○ D: $\tan^{-1} A / (1 - A^2)$

10. **$\cos(\cos^{-1} 1/5)$ = ?**

○ A: 1
○ B: 5
○ C: 1/5
○ D: 4/5

11. cos ($\sin^{-1} 1/\sqrt{2}$) = ?

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}/3$
○ C: $2/\sqrt{3}$
○ D: 1/2

12. $\cos^{-1} A - \cos^{-1} B$ = ?

○ A: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$
○ D: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

13. Which of the following function has domain ranging from - infinity to + infinity ?

○ A: $y = \sin^{-1} x$
○ B: $y = \sec^{-1} x$
○ C: $y = \cos^{-1} x$
○ D: $y = \tan^{-1} x$

TEST 2

1. The value of $\sec\left[\tan^{-1}\left(\frac{b+a}{b-a}\right) - \tan^{-1}\left(\frac{a}{b}\right)\right]$ is

○ A: $\sqrt{3}/2$
○ B: $\sqrt{2}$
○ C: 1
○ D: $1/\sqrt{3}$

2. If $y = \sin^{-1} x$ then cos ($\sin^{-1} x$) = ?

○ A: $(1-x)^{1/2}$
○ B: $(1-x)^{1/2}$
○ C: $(1-x^2)^{1/2}$
○ D: $(1+x^2)^{1/2}$

3. cos [$\tan^{-1} 1/3 + \tan^{-1} 1/2$] = ?

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}$
○ C: $\sqrt{3}/2$
○ D: 1/2

4. $\cot^{-1}$ (-1) = ?

○ A: 1
○ B: $\pi/2$
○ C: $2\pi/3$
○ D: $3\pi/4$

5. Principal value of $\sin^{-1}$ (sin $3\pi/5$) = ?

○ A: $3\pi/5$
○ B: $4\pi/5$
○ C: $2\pi/5$
○ D: $\pi/5$

6. What is the principal value of $\cot^{-1}$ ($-1/\sqrt{3}$) ?

○ A: $3\pi/2$
○ B: $\pi/3$
○ C: $\pi/6$
○ D: $2\pi/3$

7. $\sin^{-1} 3/5 + \sin^{-1} 8/17$ = ?

○ A: $\sin^{-1}$ (11 / 23)
○ B: $\sin^{-1}$ (19 / 76)
○ C: $\sin^{-1}$ (63 / 95)
○ D: $\sin^{-1}$ (77 / 85)

8. Which of the following is Domain and Range of $y = \cot^{-1} x$?

○ A: Domain: $-\infty < x < \infty$ Range: $-\pi/2 < y < \pi/2$
○ B: Domain: $-1 < x < 1$ Range: $-\pi/2 < y < \pi/2$
○ C: Domain: $-\infty < x < \infty$ Range: $-\pi < y < \pi$
○ D: Domain: $-\infty < x < \infty$ Range: $0 < y < \pi$

9. Principal value of $\sin^{-1}[\sin(2\pi/3)] = ?$

○ A: $2\pi/3$
○ B: $-2\pi/3$
○ C: $\pi/3$
○ D: $\pi/6$

10. $\cos(\sin^{-1} 3/5) = ?$

○ A: 3/5
○ B: 1/3
○ C: 4/5
○ D: $2/\sqrt{3}$

11. Range of $y = \tan^{-1} x$ is ?

○ A: $-\pi/2 < y < \pi/2$
○ B: $-\pi/2 \leq y \leq \pi/2$
○ C: $0 \leq y \leq 2\pi$
○ D: $0 < y < 2\pi$

12. $tan^{-1}\dfrac{a-b}{1+ab} + tan^{-1}\dfrac{b-c}{1+bc} = ?$

○ A: $\tan^{-1} a - \tan^{-1} c$
○ B: $\tan^{-1} a - \tan^{-1} b$
○ C: $\tan^{-1} b - \tan^{-1} c$
○ D: $\tan^{-1} c - \tan^{-1} a$

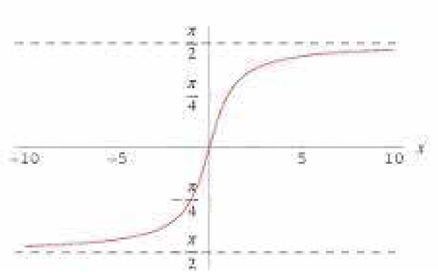
13. If $\alpha = 2\cos^{-1} 4/5$ then $\sin \alpha = ?$

○ A: 3/5
○ B: 24/25
○ C: 4/5
○ D: 30/25

14. $sin^{-1}(2x\sqrt{1-x^2}) = ?$

○ A: $\sin^{-1} x$
○ B: $2 \sin^{-1} x$
○ C: $3 \sin^{-1} x$
○ D: $4 \sin^{-1} x$

15. The graph below is for which function?



○ A: $y = \sin^{-1} x$
○ B: $y = \cos^{-1} x$
○ C: $y = \tan^{-1} x$
○ D: $y = \cot^{-1} x$

16. If $\tan^{-1}(1 + x) + \tan^{1}(1 - x) = \pi/2$ then $x = ?$

○ A: 0
○ B: 1
○ C: -1
○ D: $\sqrt{3}$

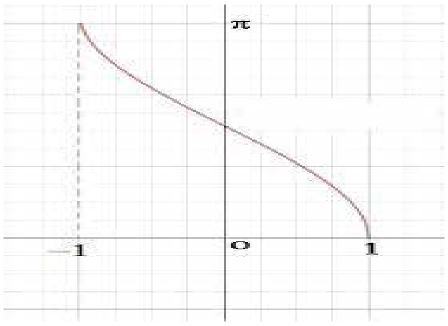
17. $y = \sec x$ is called a principal secant function if?

○ A: $-\pi \leq x \leq \pi$ and $x \neq \pi/2$ or $-\pi/2$
○ B: $-\pi/2 < x < \pi/2$
○ C: $0 \leq x \leq \pi$ and $x \neq \pi/2$
○ D: $0 \leq x < \pi/2$

18. If $\alpha = \sin^{-1} 5/13$, then $\cos \alpha = ?$

○ A: 8/13
○ B: 7/13
○ C: 11/13
○ D: 12/13

19. The graph below is for which function?



○ A: $\sin^{-1} x$ ○ B: $\cos^{-1} x$

○ C: $\tan^{-1} x$ ○ D: $\cot^{-1} x$

20. $\text{cosec}^{-1} (-2/\sqrt{3}) = ?$

○ A: $\pi/3$ ○ B: $-\pi/3$

○ C: $4\pi/3$ ○ D: $-4\pi/3$

TEST 3

1. $\sin (\sin^{-1} 1/5 + \cos^{-1} x) = 1$ then $x = ?$

○ A: 2/5 ○ B: 1/3

○ C: 1/5 ○ D: 1/2

2. $\sin (2\cos^{-1} x) = ?$

○ A: $2x\sqrt{1-x^2}$ ○ B: $2x\sqrt{1-x}$

○ C: $\dfrac{2x}{\sqrt{1-x^2}}$ ○ D: $\dfrac{2x}{\sqrt{1+x^2}}$

3. Domain and range of $y = \csc^{-1} x$ is ?

○ A: Domain : $-\infty < x < \infty$ Range : $-\pi/2 \leq y \leq \pi/2$

○ B: Domain : $-1 \leq x \leq 1$ Range : $-\pi/2 \leq y \leq \pi/2$ and $y \neq 0$

○ C: Domain : $1 \leq |x|$ Range : $-\pi/2 \leq y \leq \pi/2$ and $y \neq 0$

○ D: Domain : $1 > |x|$ Range : $-\pi/2 \leq y \leq \pi/2$ and $y \neq 0$

4. $\sin (\cos^{-1} -2/3) = ?$

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{5}/3$

○ C: $1/\sqrt{3}$ ○ D: $\sqrt{3}$

5. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, what is the value of x?

○ A: 1/6 ○ B: -1

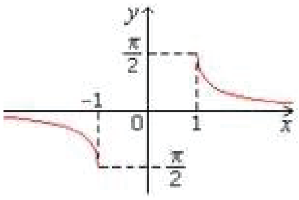
○ C: -1 and 1/6 ○ D: 1

6. $\cos^{-1} (\cos 7\pi/6) = ?$

○ A: $7\pi/6$ ○ B: $\pi/6$

○ C: $5\pi/6$ ○ D: $\pi/3$

7. The graph below is for which function?



○ A: $y = \tan^{-1} x$

○ B: $y = \cot^{-1} x$

○ C: $y = \sec^{-1} x$

○ D: $y = \csc^{-1} x$

8. If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$, then $\cos^{-1} x + \cos^{-1} y$ is equal to ?

○ A: $2\pi/3$

○ B: $3\pi/2$

○ C: $\pi/5$

○ D: $\pi/3$

9. $\tan^{-1} (-x) = ?$

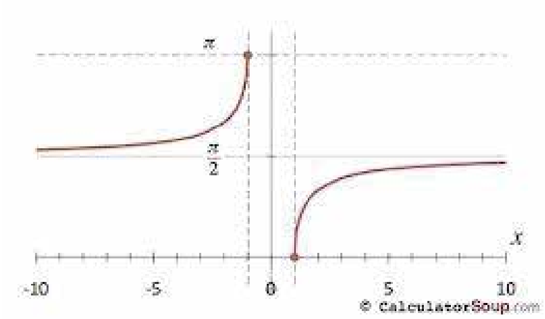
○ A: $\tan^{-1} (x)$

○ B: $- \tan^{-1} (x)$

○ C: $- \cot^{-1} (x)$

○ D: $\cot^{-1} (x)$

10. The graph below is for which function?



○ A: $y = \tan^{-1} x$

○ B: $y = \cot^{-1} x$

○ C: $y = \csc^{-1} x$

○ D: $y = \sec^{-1} x$

11. $\tan (\sin^{-1} x) = ?$

○ A: $x / (1-x^2)$

○ B: $x / (1-x)$

○ C: $\frac{x}{\sqrt{1+x^2}}$

○ D: $\frac{x}{\sqrt{1-x^2}}$

12. $\sin\left[\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right] =$

○ A: $\sqrt{3}/2$

○ B: $-\sqrt{3}/2$

○ C: ½

○ D: - 1/2

13. The value of $\tan (\cos^{-1}(4/5) + \tan^{-1} (2/3))$ is equal to ?

○ A: 7/5

○ B: 17/6

○ C: 17/18

○ D: Cannot be determined.

14. The value of $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3$ is ?

○ A: $\pi/2$

○ B: -1

○ C: 1

○ D: 0

15. $\tan(\sin^{-1} -3/4) = ?$

○ A: $3/\sqrt{5}$
○ B: $-3/\sqrt{5}$
○ C: $3/\sqrt{7}$
○ D: $-3/\sqrt{7}$

16. Value of $\cos(\tan^{-1} 15/8 - \sin^{-1} 7/25) = ?$

○ A: 114/350
○ B: 297/425
○ C: 215/345
○ D: 138/147

17. The product of the roots of the equation $\tan^{-1}(2x) + \tan^{-1}(3x) = 3\pi/4$ is ?

○ A: -1/6
○ B: -1/2
○ C: 1
○ D: 3

Function And Limits

TEST 1

1. If f(x,y,z)=2x+3y-z and f(a,b,0)=f(0,a,b), then b / a equals

○ A: 0
○ B: 2
○ C: ½
○ D: 1/4

2. Range of the function $f(x) = \sqrt{36 - x^2}$ is

○ A: $[0, -\infty]$
○ B: $[\infty, -\infty]$
○ C: $[0, 6]$
○ D: $[36, 1]$

3. If $f(x) = 3x^2 - 2x + 4$, f(-2) =

○ A: -2
○ B: 20
○ C: 4
○ D: 12

4. If $g(x) = x^3 - x^2 - x - 1$, then the value of g(-1) is:

○ A: 0
○ B: 1
○ C: -2
○ D: 2

5. Let $f(x) = 3x^2 + 4$, g(x) = 2 and h={(1,2),(2,1),(3,2)}.

○ A: f(x) is the only function.
○ B: f(x) and g(x) are the only functions.
○ C: f(x), g(x) and h(x) are all functions.
○ D: None of these are functions.

6. If f(x)=3 and g(x)=2, then f(g(x))=

○ A: 2
○ B: 3
○ C: 6
○ D: 5

7. Range of the function $f(x) = 2x - 3$ is

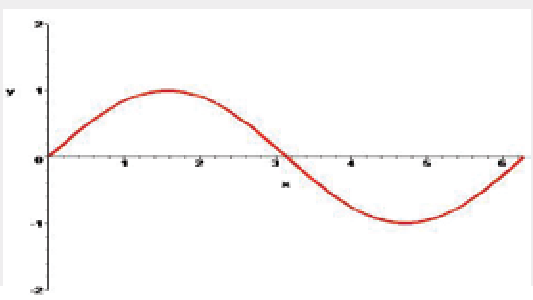
○ A: $(-\infty, +\infty)$
○ B: [2,3]
○ C: [2,10]
○ D: None of the above.

8. If f(x)=2x+3 and g(x) = x^2 - 1, then f(g(2))=

○ A: 4 ○ B: 9

○ C: 13 ○ D: 19

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If p(x)=4x-6 and p(a)=0, then a=

○ A: 3 ○ B: 2

○ C: 3/2 ○ D: 2/3

11. If f(x)=x and g(x)=x.f(x), then f(x) / g(x) =

○ A: x ○ B: 1/x

○ C: 1 ○ D: None of the above.

12. If $f(x) = x^7 - 97x^6 - 199x^5 + 99x^4 + 2x + 195, f(-1)$ equals:

○ A: 24 ○ B: 154

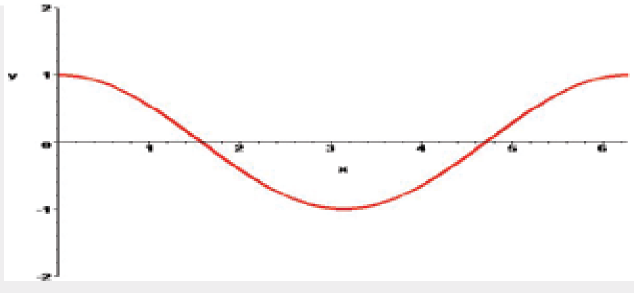
○ C: 272 ○ D: 393

13. What value(s) must be excluded for the domain of f={(x,y):y=$\frac{x+2}{x-2}$}?

○ A: 2 ○ B: -2

○ C: 0 ○ D: 2 and -2

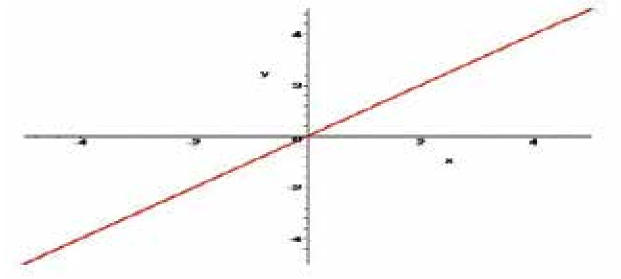
14. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial
○ C: Odd Degree Polynomial ○ D: None of the Above

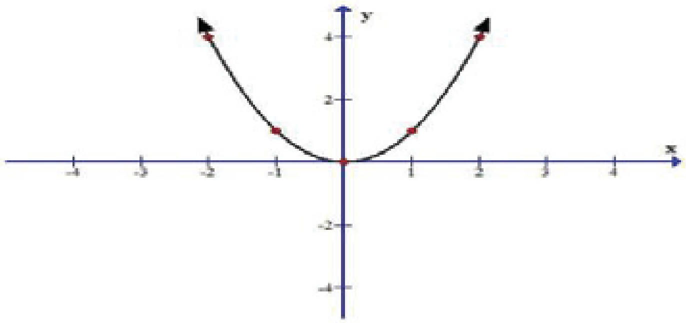
16. If f(1) = 1 and f(2) = 2 and f(-1) = -1, then f(x) would be:

○ A: 0 ○ B: 1
○ C: 2 ○ D: x

17. If $f(r,\theta) = r\cos\theta, f(2,\frac{\pi}{3}) =$

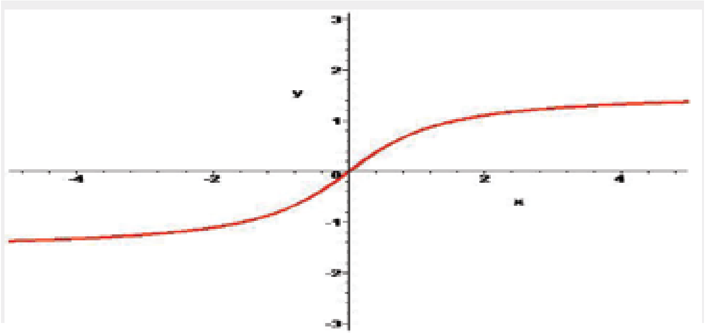
○ A: 2π ○ B: 1
○ C: $\frac{\pi}{6}$ ○ D: $\frac{1}{2}$

18. Which of the following functions represents the plot shown?



○ A: $f(x) = x^2$ ○ B: $f(x) = x^2 - x - 5$
○ C: $f(x) = x^3$ ○ D: None of the above.

19. The following figure shows a graph of which type of function?



○ A: Cosecant ○ B: Secant
○ C: Cotangent ○ D: Arctangent

20. If $f(x, y, z) = x^2 + y^2 - 2z$ for all real numbers x, y and z, then f(-1,-1,-1)=

○ A: 0 ○ B: 2
○ C: 4 ○ D: 6

TEST 2

1. **If f(x,y)=3x+2y-8 and g(z) = z^2 for all real numbers x,y,z then f(3,g(4))=**

   ○ A: 15 ○ B: 33

   ○ C: 45 ○ D: 25

2. **For a function to be even as well as odd, it must be:**

   ○ A: Symmetric about origin (by 180^0) ○ B: Symmetric about y-axis (by 180^0)

   ○ C: Both A and B ○ D: None of the above

3. **If g(x)=3 and $f(x) = \dfrac{1}{3x+2}$, then f(g(3))=**

   ○ A: 1/11 ○ B: 1/17

   ○ C: 3/5 ○ D: 9/11

4. **Which statement is correct for the following functions?**

   $f(x) = \frac{2}{7}x^2$, $g(x) = -x^3$

   ○ A: Both I and II are even. ○ B: Both I and II are odd.

   ○ C: I is even and II is odd. ○ D: I is odd and II is even.

5. **If f(x) = x+3 and g(x) = x^2 , for what value of does f(g(x))=g(f(x))**

   ○ A: 1 ○ B: 0

   ○ C: -1 ○ D: 2

6. **Which of the following relations are said to be odd?**

   y=x^2 + 1, y=sin (x), y = x^3 -x + 1

   ○ A: Only II. ○ B: Only I & II.

   ○ C: Only I & III. ○ D: Only II & III.

7. ***Find the inverse of*** $g(x) = \dfrac{2x}{x-1}$

   ○ A: $g^{-1}(y) = \dfrac{y+5}{y-2}$ ○ B: $g^{-1}(y) = \dfrac{y}{y-2}$

   ○ C: $g^{-1}(y) = \dfrac{y-7}{y}$ ○ D: $g^{-1}(y) = \dfrac{y+4}{y-2}$

8. **If f(x) = x^2 + 3x - 4 and g(x)=x-4, then f(g(x))=**

   ○ A: $2x^2$ - 3x + 2 ○ B: $2x^2$ - 3x

   ○ C: x^2 - 5x + 10 ○ D: x^2 - 5x

9. **Find** $\displaystyle\lim_{x\to 1} \frac{\sqrt{x}-1}{x-1}$

   ○ A: ¼ ○ B: 1/2

   ○ C: 1 ○ D: 2

10. Assuming that $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ exist, which of the following is correct:

○ A: If $f(x) \geq 0$, then $\lim_{x \to a} f(x) \geq 0$

○ B: If $f(x) \geq g(x)$, then $\lim_{x \to a} f(x) \geq \lim_{x \to a} g(x)$

○ C: If $f(x) \geq 0$, then $\lim_{x \to a} \sqrt{f(x)} = \sqrt{\lim_{x \to a} f(x)}$

○ D: All are correct.

11. If {(3,2),(4,2),(3,1),(7,1),(2,3)} is to be a function, which of the following must be removed from the set?

○ A: (3,2) ○ B: (4,2)

○ C: (2,3) ○ D: None of the above.

12. To show a function is discontinuous, we can do one of three things:

Show that the function fails the sequence definition, Show that the function fails the ε -> δ definition

Prove by contradiction by relating it to a function known to be discontinuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

○ C: None of these are correct. ○ D: (i), (ii) and (iii) are correct.

13. If f(x,y)=x+y and g(x,y)=x-y, then f(g(2,1),f(2,-1)) equals:

○ A: 0 ○ B: 1

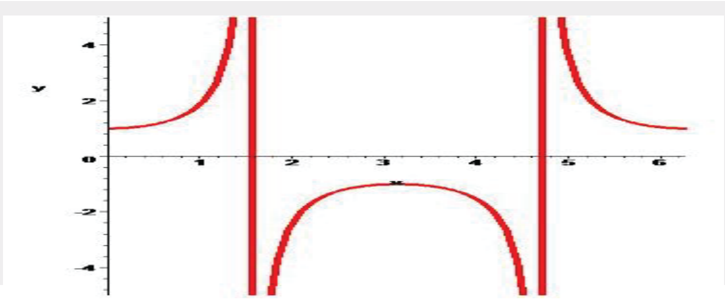
○ C: 2 ○ D: 4

14. Range of the function f(x)= sin (x) is

○ A: [-1,1] ○ B: $[-\frac{\pi}{2}, \frac{\pi}{2}]$

○ C: [0,1] ○ D: None of the above.

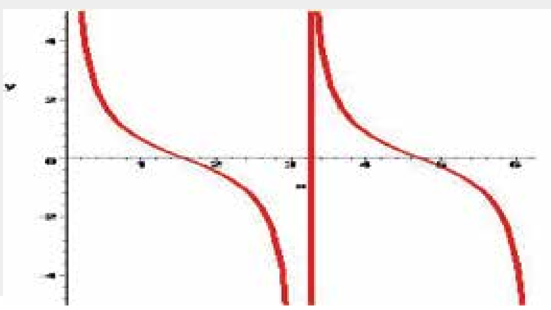
15. The following figure shows a graph of which type of function?



○ A: Tangent ○ B: Secant

○ C: Cosecant ○ D: Cosine

16. The following figure shows a graph of which type of function?



○ A: Cotangent ○ B: Arctangent

○ C: Cosecant ○ D: Tangent

17. f(x)=cos x, g(x)=sin x, h(x) = ±√x

○ A: f(x) is the only function.
○ B: g(x) is the only function.
○ C: f(x) and g(x) are the only function.
○ D: All three are functions.

18. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is not true:

○ A: $\lim_{x\to a}(f(x) \pm g(x)) = \lim_{x\to a} f(x) \pm \lim_{x\to a} g(x)$
○ B: $\lim_{x\to a}(f(x)g(x)) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$
○ C: $\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$
○ D: $\lim_{x\to a} |f(x)| = -\left|\lim_{x\to a} f(x)\right|$

19. If $f(x, y) = 2x^2 - y^2$ and $g(x) = 2^x$, which of the following equal 2^{2x} ?

○ A: f(x,g(x))
○ B: f(g(x),x)
○ C: f(g(x),g(x))
○ D: f(g(x),0)

20. If $f(x) = 4x + 2$ for all x, then for x=0.5 $f^{-1}(x) =$?

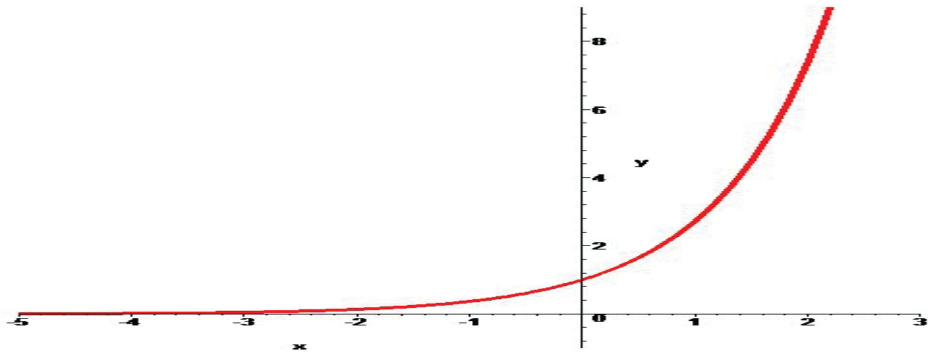
○ A: 4
○ B: $\frac{1}{16}$
○ C: $\frac{1}{4}$
○ D: $-\frac{3}{8}$

TEST 3

1. If g(x-1)= x^2 + 2, then g(x)=

○ A: x^2 - 2x + 3
○ B: x^2 + 2x + 3
○ C: x^2 - 2x + 6
○ D: x^2 - 2x

2. The following figure shows graph of which type of function?



○ A: Log Function
○ B: Exponential Growth
○ C: Exponential Decay
○ D: None of the above.

3. **If $f(x) = 3x - 5$ and $g(y) = y^2 - 1$, then f(g(z)) equals**

○ A: $(3z - 5)^2 - 1$ ○ B: $3z^2 - 8$

○ C: $3z^3 - 5z^2 - 3z + 8$ ○ D: $x^2 + 3z - 8$

4. $\lim\limits_{x\to 0} \dfrac{\cos(2x) - 1}{\cos x - 1}$ **= ?**

○ A: 2 ○ B: 4

○ C: 8 ○ D: 10

5. $\lim\limits_{h\to 0} \dfrac{\cos h - 1}{h} =$

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

6. $\lim\limits_{x\to 0} \dfrac{x^4 + 5x - 3}{2 - \sqrt{x^2 + 4}}$ **= ?**

○ A: 6 ○ B: 15

○ C: ∞ ○ D: None of the above.

7. **If f(x) = x^2 - 4, for what real number values of x will f(f(x))=0?**

○ A: $\sqrt{6}$ ○ B: $\pm\sqrt{6}$

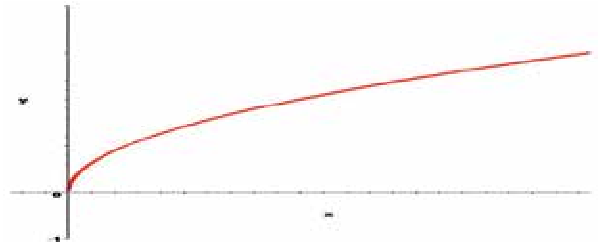
○ C: $\pm\sqrt{2}or \pm \sqrt{6}$ ○ D: No values

A straight line function, whose graph bisects the second and the fourth quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: a ○ B: -a

○ C: -2a ○ D: 0

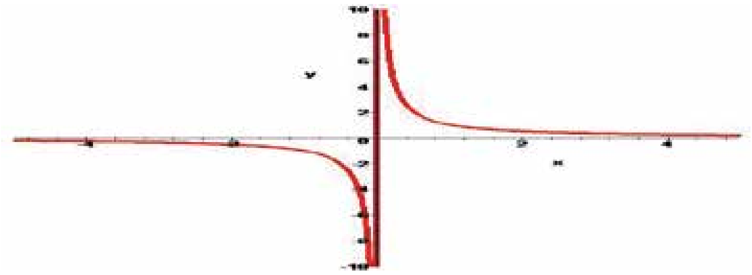
8. **The following figure may show a graph of which function?**



○ A: $y = \sqrt{x}$ ○ B: $y = \sqrt[6]{x}$

○ C: $y = \sqrt[5]{x}$ ○ D: Both A and B.

9. The figure shown below depicts a graph of which of the following functions?



○ A: y=x+5

○ B: $y = x^2 / (x+2)$

○ C: $y = x^3 - 4$

○ D: $y = 1 / x^3$

10. If $f(x) = 2^x$, then $f(\log_2 5)$=

○ A: 2^5

○ B: 2^2

○ C: 2

○ D: 5

11. If f is a linear function and f(1)=-2,f(-2)=1 and f(x)=1.5, what is x?

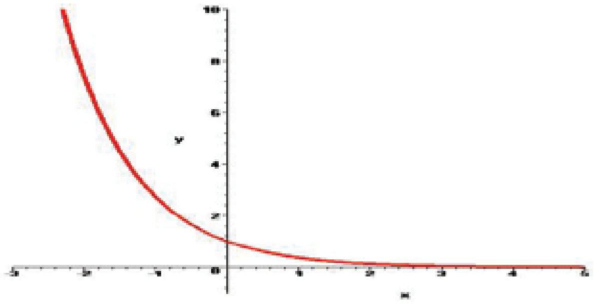
○ A: 0.5

○ B: -0.5

○ C: -1.5

○ D: -2.5

The wing figure shows a graph of which type of function?



○ A: Log function

○ B: Exponential Growth

○ C: Exponential Decay

○ D: None of the above.

12. If $f(x) = 3 - 2x + x^2$, then $\dfrac{f(x+t) - f(x)}{t}$ equals

○ A: t-x+4

○ B: t+2

○ C: t+2x-2

○ D: 2x-2

13. To show a function is continuous, we can do one of three things:

Show it satisfies the sequence definition of continuity, Show it satisfies the ε -> δ definition of continuity

Decompose it into simpler functions we already know to be continuous

○ A: Only (i) is correct.

○ B: Only (i) and (iii) are correct.

○ C: (i), (ii) and (iii) are correct.

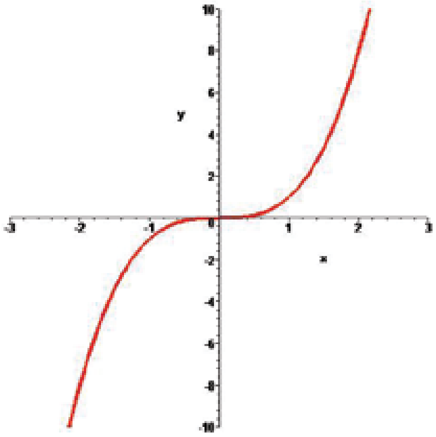
○ D: None of these are correct.

14. **If** $f(x) = \left\{\begin{matrix} \frac{5}{x-2} & when & x \neq 2 \\ k & when & x = 2 \end{matrix}\right\}$**, what must the value 'k' equal in order that f(x) be a continuous function?**

○ A: 2 ○ B: 5

○ C: 0 ○ D: No value of k will make f(x) a continuous function.

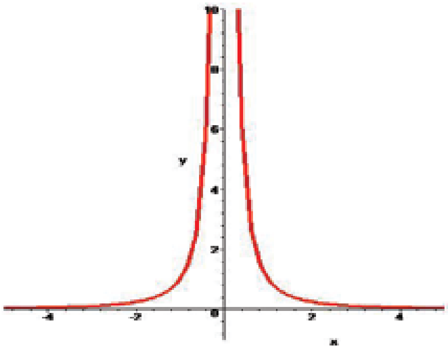
15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the above.

16. The figure shown below depicts a graph of which of the following functions?



○ A: $y = x^2 + 2x + 3$ ○ B: $y = 1 / x^2$

○ C: $y = 1 / x^3$ ○ D: None of the above.

17. If $f(x) = \dfrac{3x-1}{2}$ **and f(g(x))=x, then g(x)=**

○ A: $\dfrac{2x-1}{3}$ ○ B: $\dfrac{2x+1}{3}$

○ C: $\dfrac{2x}{3}+1$ ○ D: $\dfrac{2x}{3}-2$

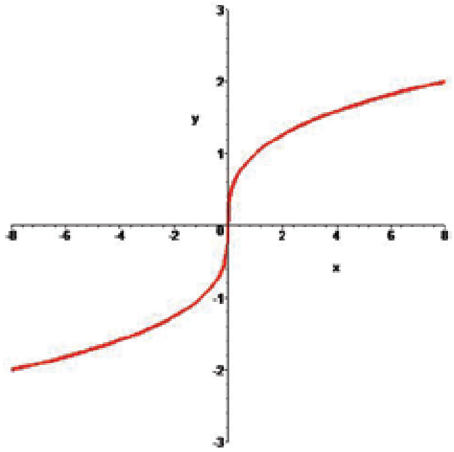
18. A straight line function, whose graph bisects the first and the third quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: 0 ○ B: 1

○ C: a ○ D: 2a

TEST 4

1. **The figure shown may depict a graph of which of the following functions?**



○ A: $y = \sqrt[3]{x}$ ○ B: $y = \sqrt[4]{x}$

○ C: Both A and B. ○ D: None of the above.

2. **Find** $\lim_{x\to\infty} \frac{x^2+5x+1}{2x^2-10}$

○ A: 1/6 ○ B: 1/4

○ C: ½ ○ D: 1

3. **Domain of the function f(x) = 5x^3 + 4x^2 +2x - 5 is:**

○ A: (-∞ , +∞) ○ B: (-4,4)

○ C: (-5,5) ○ D: None of the above.

4. **f={(x,y):y=4}, g={(x,y):$x^2 - y^2$=1}, and h={(x,y):x=3}, which of the these is a function?**

○ A: f only ○ B: g only

○ C: h only ○ D: f and h only

5. **If f(x) = x^2 + 1 and f(g(x))=4x-3, then g(x)=**

○ A: $2\sqrt{x} - 1$ ○ B: $2\sqrt{x-1}$

○ C: $\sqrt{x-1}$ ○ D: x-4

6. **If g(x)=3x+2 and g(f(x))=x, then f(2)=**

○ A: 2 ○ B: 6

○ C: 0 ○ D: 8

7. **If f(x,y)=2x-y and g(z)=sin z, then** $g(f(\pi, \frac{\pi}{2}))$ **equals:**

○ A: 0 ○ B: -1

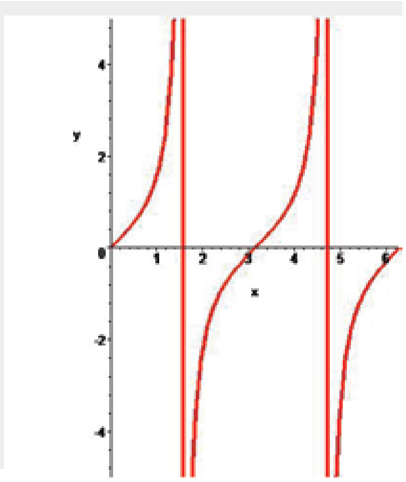
○ C: 1 ○ D: 2

8. Which of the following is the inverse of the function $f(x) = \sqrt{x} - 1$, for all x>0?

○ A: $(x+1)^2$ ○ B: $x^2 + 2$

○ C: x+1 ○ D: x-2

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If $f(x) = x - \frac{1}{x}$, then $f(a) - f(\frac{1}{a})$ equals:

○ A: 0 ○ B: 2a - 2/a

○ C: a - 1/a ○ D: 1

11. If f(x)=2x-3, the inverse of f(x) could be represented by:

○ A: $f^{-1}(x) = 3x - 2$ ○ B: $f^{-1}(x) = \frac{1}{2x-3}$

○ C: $f^{-1}(x) = \frac{x+2}{3}$ ○ D: $f^{-1}(x) = \frac{x+3}{2}$

12. What value(s) must be excluded for the domain of $\frac{f}{g}(x)$ if $f(x) = 3x^2 - 4x + 1$ and $g(x) = 3x^2 - 3$?

○ A: 0 ○ B: 3

○ C: 1 ○ D: both ±1

13. $\lim\limits_{x=3} = \frac{5x^2 - 8x - 13}{x^2 - 5}$ = ?

○ A: 0 ○ B: 5

○ C: -2 ○ D: 2

14. If f(g(x)) = x^2 - 10 and g(x)=x+3 , then f(x)=

○ A: $x^2 + 6x + 8$ ○ B: $x^2 - 6x - 1$

○ C: $x^2 - 6x$ ○ D: $x^2 + 8$

15. If f(x)=x, the inverse of f, f^{-1}, could be represented by:

○ A: $f^{-1}(x) = x$

○ B: $f^{-1}(x) = 1$

○ C: $f^{-1}(x) = y$

○ D: $f^{-1}(x) = \frac{1}{x}$

16. If f(x) = x^3 - 4, then the inverse of f=

○ A: $-x^3 + 4$

○ B: $\sqrt[3]{x+4}$

○ C: $\sqrt{x-4}$

○ D: $\frac{1}{x-4}$

17. Find $\lim_{x\to 4} \frac{x^2 - 6x + 8}{x - 4}$**.**

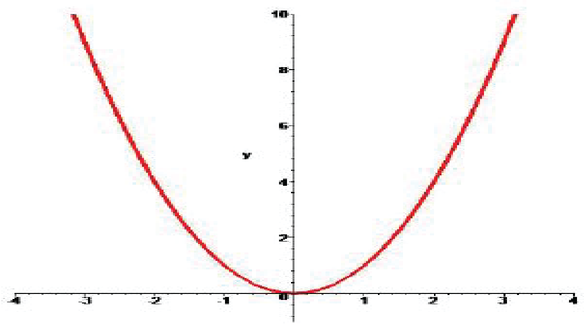
○ A: -2

○ B: 0

○ C: 2

○ D: 4

18. The following figure shows graph of which type of function?



○ A: Linear function

○ B: Even degree polynomial

○ C: Inverse of even degree polynomial

○ D: Inverse of odd degree polynomial

19. Find $\lim_{x\to\infty} \frac{3x^2 + 1}{4x^3 + 2x + 1}$

○ A: 0

○ B: 4

○ C: 10

○ D: 15

20. If f(x) = ax^2 + bx + c and f(1) = 3 and f(-1) = 3, then a+c equals

○ A: -3

○ B: 0

○ C: 3

○ D: 6

Differentiation

TEST 1

1. $\lim\limits_{x \to 0} \dfrac{1 - cos\, x}{x} \;=?$

○ A: 1 ○ B: 0
○ C: -1 ○ D: Infinity

2. **d/dx f(x).g(x) = ?**

○ A: f(x).g(x) ○ B: f'(x).g(x) + f(x).g'(x)
○ C: f'(x).g(x) - f(x).g'(x) ○ D: f'(x).g'(x) + f(x).g(x)

3. **d/dx Sin^{-1} x = ?**

○ A: $1/(1-x^2)^{1/2}$ ○ B: $-1/(1-x^2)^{1/2}$
○ C: $1/(1+x^2)^{1/2}$ ○ D: $-1/(1+x^2)^{1/2}$

4. **What is the derivative of $(2x + 3)^5$?**

○ A: $10(2x + 3)^4$ ○ B: $10(2x + 3)^6$
○ C: $5(2x + 3)^4$ ○ D: $5(2x + 3)^6$

5. **dy/dx of f(x) = log(log (x)) is ?**

(Please assume log as "Log to the base e" or Ln)

○ A: 1 / log x ○ B: x / log x
○ C: 1 / (x log x) ○ D: 2 / log x

6. $\dfrac{d}{dx} log(sin\, x) \;=?$

○ A: tan x ○ B: cot x
○ C: 1 / sin x ○ D: 1 / cos x

7. **If $y=e^x$, then the rate of change of y with respect to x at point (0,1) is?**

○ A: e ○ B: 1
○ C: -1 ○ D: 2

8. **Under which of the following condition the given expression is true?**

$$\frac{f(x_1) - f(x)}{x_1 - x} = f'(x)$$

○ A: As x approaches the value of x_1. ○ B: As x_1 approaches the value of x.
○ C: As x approaches the value of 0. ○ D: Both A and B.

9. $\lim\limits_{\Delta x \to 0} \dfrac{f(x + \Delta x) - f(x)}{\Delta x} \;=?$

○ A: f'(x) ○ B: ∫ f(x)dx
○ C: ∫ f'(x)dx ○ D: None of the above.

10. If y = 1/ x^2 then dy/dx at x = -2 is ?

○ A: ¼

○ B: 1

○ C: ½

○ D: -1/2

11. d/dx sin x at x = π/2 is?

○ A: 1

○ B: -1

○ C: √2/2

○ D: 0

12. d/dx ($\cos^2 x + \sin^2 x$) = ?

○ A: 2 sin x + 2 cos x

○ B: 0

○ C: 2 sin x cos x

○ D: 1

13. Which of the following statement is false?

○ A: d/dx c = 0 ; where c is a constant.

○ B: d/dx [c f(x)] = c d/dx f(x)

○ C: d/dx [f(x) * g(x)] = d/dx f(x) * d/dx g(x)

○ D: d/dx [f(x) + g(x)] = d/dx f(x) + d/dx g(x)

14. Who is/or thought to be the inventor of differential calculus and fundamental theorums of calculus?

○ A: Albert Einstien.

○ B: Isaac Newton.

○ C: Gottfried Leibniz

○ D: Both B and C.

15. Derivative of ln e^{4x} w.r.t x is?

○ A: 4

○ B: 4x

○ C: 1/e^{4x}

○ D: e^{4x}

16. The slope of a curve at point P = 7. If dx = 0.01 and it is very close to P then dy =?

○ A: 0

○ B: 0.7

○ C: 0.07

○ D: 0.49

17. The equation of a line is y = 9/4 x - 33. What is the property of dy/dx?

○ A: It is increasing.

○ B: It is decreasing.

○ C: It is a constant value.

○ D: It is first increasing and then decreasing.

18. $\frac{d}{dx}x^n \;=?$

○ A: nx

○ B: nx^n

○ C: nx^{n-1}

○ D: 1/n+1 x^{n+1}

19. What is the derivative of 1/ $(ax + b)^n$?

○ A: -n $(ax + b)^{-n-1}$

○ B: - an $(ax + b)^{n-1}$

○ C: -an $(ax + b)^{-n-1}$

○ D: -n $(ax + b)^{n-1}$

20. $\lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} \;=?$

○ A: f' (x)

○ B: dy / dx

○ C: ∫ f''(x)dx

○ D: All of the above.

TEST 2

1. **If the tangent to the graph of f(x) at the point "a" makes an angle of 45° with the x-axis, then what is the value of f'(x)?**

○ A: 0 ○ B: 1
○ C: 2 ○ D: Not enough information.

2. **The function f(x) = cot (x) sin (x) has how many stationary points in the interval [0 , 2π]?**

○ A: 0 ○ B: 1
○ C: 2 ○ D: 3

3. **Which of the following is the correct expansion of sin x as Maclaurin series?**

○ A: $1 - x + x^2 - x^3$ .... ○ B: $x - x^3/3! + x^5/5! - x^7/7!$ .....
○ C: 1 + x/1! - 2x/2! + 3x/3! ..... ○ D: 1 + 0.1x + 0.01x + 0.001x ....

4. **Which of the following is not true?**

○ A: $a = d^2s/dt^2$ ○ B: a = dv/dt
○ C: v = ∫ a dt ○ D: v = ∫ s dt

5. $\frac{d}{dx}(\frac{a+x}{a-x}) \;=?$

○ A: 0 ○ B: $2(a+x) / (a-x)^2$
○ C: $2a / (a-x)^2$ ○ D: $a / (a-x)^2$

6. **What are the two positive integers, whose sum is hundred and product is maximum?**

○ A: 30, 70 ○ B: 45, 55
○ C: 43, 57 ○ D: 50, 50

7. **Value of e is equal to which of the following infinite series?**

○ A: 1 + 1/1! + 1/2! + 1/3! ... ○ B: 1 + 0.1 + 0.01 + 0.001 ...
○ C: $1 - 1^3/3! + 1^5/5! - 1^7/7!$ .... ○ D: 1! - 2! + 3! - 4! ...

8. **What is the derivative of $(1 + \tan^2\theta)$ w.r.t tan θ?**

○ A: 2 sec θ ○ B: 2 tan θ
○ C: $\sec^2 \theta$ ○ D: $2 \tan\theta \sec^2\theta$

9. **Which of the following is not true for function $f(x) = |4 - x^2|$?**

○ A: Function value is always positive.
○ B: Function is continuous.
○ C: Function is differentiable at x = +2 and -2.
○ D: Its domain is the set of all real numbers.

10. $\frac{d}{dx}e^{e^x} \;=?$

○ A: $e^x e^{e^x}$ ○ B: e^{e^x}
○ C: e^{2x} ○ D: $1/e^x$

11. $\frac{d}{dx}tan^{-1}\sqrt{\frac{1-cos\,x}{1+cos\,x}}\ =?$

○ A: 1 ○ B: 2

○ C: ½ ○ D: -1/2

12. Maximum value of (ln x) / x is ?

○ A: 0 ○ B: 1

○ C: e ○ D: 1/e

The maximum area of a rectangle of perimeter 176 cm is?

○ A: 1854 cm^2 ○ B: 1936 cm^2

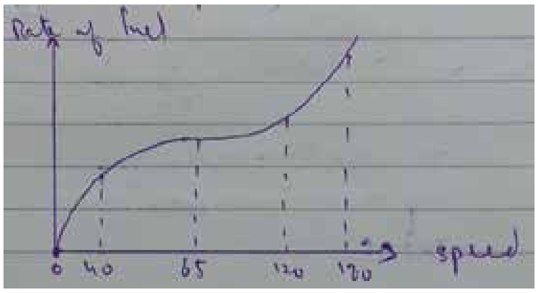
○ C: 2110 cm^2 ○ D: 3246 cm^2

13. What is the derivative of $(x^3+1)^9$?

○ A: $9(x^3+1)^8$ ○ B: $10(x^3+1)^{10}$

○ C: $9x^2\,(x^3+1)^8$ ○ D: $27x^2\,(x^3+1)^8$

14. The graph below shows the rate of fuel consumption with respect to the speed of the car. What is the most efficient speed with repect to the fuel consumption?



○ A: 40 ○ B: 65

○ C: 120 ○ D: 180

15. Critical point on the graph is the point for which?

○ A: f'(x) = 0 ○ B: f'(x) does not exist

○ C: f'(x) = 1 ○ D: Both A and B.

16. Derivative of an even function is always ?

○ A: An odd function ○ B: An even function

○ C: Negative function ○ D: Could be even or odd

17. If distance s of an object is given by the function $s=100t - 25t^2$, then what is the velocity at t= 1/2?

○ A: 25 ○ B: 50

○ C: 75 ○ D: 100

18. $x^2 + y^2 = 4$ is the equation of a circle. What is the slope at a point where x = 0?

○ A: 0 ○ B: 2

○ C: 4 ○ D: 1/2

19. If y = f(f(x)) ; f(0) = 0 and f'(0) = 1, then y'(0) is equal to ?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 1/2

TEST 3

1. If $y = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \_\_\_ \infty\right)$, then $\frac{dy}{dx}$ =

○ A: 0 ○ B: 1

○ C: x ○ D: y

2. The function $x^3 + x^2 - 5x - 5$ is increasing at which interval?

○ A: (-infinity , - 5/3] ○ B: [1 , infinity)

○ C: [-5/3 , 1] ○ D: Both A and B.

3. d/dx cos(cos(cos x))) = ?

○ A: -sin [cos (cos x)].sin x cos x ○ B: - cos [sin (sin x)] sin x sin x

○ C: -sin [cos (cos x)] sin (cos x) sin x ○ D: sin [cos (cos x)] cos (cos x)

4. $\frac{d}{dx}[\cos^{-1}(4x^3 - 3x)] = ?$

○ A: $\frac{3}{\sqrt{1-x^2}}$ ○ B: $\frac{-3}{\sqrt{1-x^2}}$

○ C: $\frac{3}{\sqrt{1+x^2}}$ ○ D: $\frac{-3}{\sqrt{1+x^2}}$

5. y = |cos x| is not differentiable for x = ? (n in the given choices represent a set of integers)

○ A: nπ/2 ○ B: (2n+1) π/2

○ C: nπ ○ D: (n+1) π

6. If $y = e^{2x + 3 \log x}$, then dy/dx is equal to?

○ A: $x^2 e^{2x} (2x + 3)$ ○ B: $x^2 e^{2x} (2x - 3)$

○ C: $x^3 e^{2x}$ ○ D: $x^2 e^{2x} 2x$

7. If x > 0 and xy = 1, then the minimum value of (x + y) is?

○ A: -2 ○ B: -1

○ C: 1 ○ D: 2

8. The point at which the curve $y = x^3 - 4x + 3$ has gradient 8 is?

○ A: (2,3) ○ B: (4,5)

○ C: (1,0) ○ D: (0,1)

9. If x = (cos θ + θ sinθ), y = (sinθ - θ cos θ), then dy/dx is equal to ?

○ A: tan θ ○ B: cot θ

○ C: sin θ ○ D: cos θ

10. $\frac{d}{dx}\left(tan^{-1}\sqrt{\frac{1 + cos\,x}{1 - cos\,x}}\right) =?$

○ A: -1 ○ B: 1

○ C: ½ ○ D: -1/2

11. The graph $f(x)=\cot x$ has critical points at which of the following points in the interval $[0,\pi]$?

○ A: 0 and π
○ B: 0 and π/2
○ C: π and π/2
○ D: π/4 and π/2

12. The minimum value of $(x^2 + 250/x)$ = ?

○ A: 75
○ B: 50
○ C: 5
○ D: The function has no minimum value.

13. tan x is ____ function in the interval $[0,\pi/2]$?

○ A: Increasing
○ B: Decreasing
○ C: Constant
○ D: Discontinuous

14. The function $x^3 - 27x + 5$ is increasing when?

○ A: $|x| > 3$
○ B: $|x| < 3$
○ C: $x < -3$
○ D: $x > 3$

15. If $y = \tan^{-1}(\sqrt{1 + x^2} + x)$, then $\frac{dy}{dx}$ = ?

○ A: $1 / 2(1+x^2)$
○ B: $-1 / 2(1+x^2)$
○ C: $1 / 2(1-x^2)$
○ D: $2 / (1-x^2)$

16. The point on the curve $y = \sqrt{x}$ at which the tangent makes an angle of 45° with x axis is?

○ A: (1,1)
○ B: (1/16,1/4)
○ C: (4,2)
○ D: (1/4, 1/2)

17. If $y = 12x^9 + 13x^7 + 5x^5 +19$ then which of the following is true?

○ A: $d^5y/dx^5 = 0$
○ B: $d^7y/dx^7 = 0$
○ C: $d^9y/dx^9 = 0$
○ D: $d^{10}y/dx^{10} = 0$

18. If $x > 0$, $y > 0$ and $x + y = 18$, then the maximum value of xy is?

○ A: 77
○ B: 81
○ C: 85
○ D: 144

19. If $\sqrt{x} + \sqrt{y} = \sqrt{a}$ then dy/dx = ?

○ A: $(y/x)^{1/2}$
○ B: $(x/y)^{1/2}$
○ C: $-(y/x)^{1/2}$
○ D: $-(x/y)^{1/2}$

20. Derivative of $a^{\sqrt{x}}$ = ?

○ A: $a^{\sqrt{x}} \ln a$
○ B: $a^{\sqrt{x}}$
○ C: $a^{\sqrt{x}} / \ln a$
○ D: $a^{\sqrt{x}} \ln a / 2\sqrt{x}$

TEST 4

1. **What is $d^{19}y/dx^{19}$ if $y = e^{-x}$?**

○ A: e^{-x}
○ B: $-e^{-x}$
○ C: $19e^{-x}$
○ D: $-19e^{-x}$

2. **The position of an object is given by $x = 15t - 5t^3$ where x is the position. What is the acceleration of the object when it is momentarily at rest?**

○ A: 0
○ B: 1
○ C: 15
○ D: -30

3. **A rectangle has perimeter 100m. Its maximum area would be?**

○ A: 480 m^2
○ B: 625 m^2
○ C: 690 m^2
○ D: 765 m^2

4. **The maximum value of function f(x) = sin x cos x is?**

○ A: 1
○ B: 2
○ C: ½
○ D: 0

5. **If x = log t and $y = t^2 - 1$, then the value of d^2y/dx^2 at t = 1 is?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. **What is the second derivative of $(3t + 2)^{-2}$ with respect to t?**

○ A: $-6(3t + 2)^{-3}$
○ B: $6(3t + 2)^{-4}$
○ C: $54(3t + 2)^{-3}$
○ D: $54(3t + 2)^{-4}$

7. **What is the derivative of sin x w.r.t cos x?**

○ A: cos x
○ B: tan x
○ C: - cot x
○ D: - cos x sin x

8. **d/dx sin x^o = ? (x is in degrees)**

○ A: cos x^o
○ B: x cos x^o
○ C: $(-\pi/180)$ cos x^o
○ D: $(\pi/180)$ cos x^o

9. $\frac{d}{dx} e^{ln\, sin\, x^2} \quad =?$

○ A: 2x cos x^2
○ B: x cos x^2
○ C: cos x^2
○ D: 1/sinx * 2 $e^{\sin x}$

10. **If d/dx $(3x^3 + x)$ = d/dx $(-3x^2 - 5)$ then x = ?**

○ A: 1 or 2
○ B: -1/3
○ C: 0 or -1/3
○ D: 0 or 1

11. **$d(x^x)$ / dx = ?**

○ A: x^x (1 + log x)
○ B: 1 + log x
○ C: log x
○ D: x log x

12. If $y = 3x^2 - 12x + 8$ then the slope of tangent at point (3,-1) is?

○ A: -18
○ B: 6
○ C: -19
○ D: 8

13. The curve $y = \sin(x)$ with domain = set of all real numbers has how many stationary points?

○ A: Infinite
○ B: 0
○ C: 1
○ D: 2

14. The derivative of $e^x \sin x$ w.r.t. e^x is

○ A: cos x + sin x
○ B: cos x
○ C: sin x
○ D: $e^x(\sin x + \cos x)$

15. If $\sin x = \frac{t}{\sqrt{1+t^2}}$, then $\frac{dx}{dt}$ is equal to

○ A: 1
○ B: $1 / (1+t^2)$
○ C: $1 / (1 - t)^{1/2}$
○ D: $1 / (1 + t^2)^{1/2}$

16. Differentiating $\ln(x^2 + 2x)$ w.r.t x gives?

○ A: $1 / (x^2+2x)$
○ B: ln (2x + 2)
○ C: (2x+2) / x
○ D: $(2x+2) / (x^2+2x)$

17. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \ldots \text{to } \infty}}}$, then $\frac{dy}{dx}$ is equal to

○ A: x / (2y - 1)
○ B: x / (2y + 1)
○ C: log x / (2y - 1)
○ D: 1 / x(2y - 1)

18. If $y = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ and $\theta = \tan^{-1}x$, then $\frac{dy}{d\theta} = ?$

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: x/2

19. What is the derivative of $(x^2 + 1)(x^3 + 7)$ w.r.t x is?

○ A: $5x^3 + 15x + 14$
○ B: $5x^4 + 3x^2 + 14x$
○ C: $6x^3$
○ D: $6x^3 + 7$

20. The graph of function $y = x^3$ has a _____ point at x = 0 ?

○ A: Inflection
○ B: Stationary
○ C: Turning
○ D: Both A & B.

Integration

TEST 1

1. ∫ f(x)g'(x) dx = ?

○ A: f(x)g(x) - ∫ g(x)f'(x) dx ○ B: f(x)g(x) + ∫ g(x)f'(x) dx

○ C: f(x)g(x) - ∫ g'(x)f(x) dx ○ D: f(x)g(x) + ∫ g'(x)f(x) dx

2. ∫ cot x dx = ?

○ A: ln |cos x| + c ○ B: ln |sec x| + c

○ C: ln |sin x| + c ○ D: ln |cosec x| + c

3. $\int_0^{3\pi/2} cos(x)dx \ =?$

○ A: 0 ○ B: 1

○ C: 3 ○ D: -1

4. $\int \frac{\tan \sqrt{x}}{\sqrt{x}}\, dx =$

○ A: ln |cos √x| ○ B: 2 ln |cos √x|

○ C: ln |sec √x| ○ D: 2 ln |sec √x|

5. The solution of the differential equation dy/dx = 2xy is?

○ A: $y = ce^{-x^2}$ ○ B: $y = ce^{x^2}$

○ C: $y^2 = 2x^2 + c$ ○ D: None of the above.

6. $\int_0^{\pi} sin(x)dx \ =?$

○ A: 0 ○ B: 1

○ C: 2 ○ D: √2

7. ∫ $(3x^2 - 2x + 1)$ dx = ?

○ A: $x^3 - x^2 + 1 + c$ ○ B: $x^3 - x + 1 + c$

○ C: $x^3 - x^2 + x + c$ ○ D: $x^3 + x^2 + x + c$

∫ sec x tan x dx =?

○ A: tan x + c ○ B: cot x + c

○ C: cosec x + c ○ D: sec x + c

8. $\int_{-2}^{3} x^2 dx \ =?$

○ A: 8/3 ○ B: 19/3

○ C: 28/3 ○ D: 35/3

9. If $f(x) = x^2$ then find dy when x = 3 and dx = 0.01?

○ A: 0.02
○ B: 0.04
○ C: 0.06
○ D: 0.08

10. $\int tan^2 x\, dx \;\; =?$

○ A: 2 tan x $\sec^2$ x + c
○ B: tan x + x + c
○ C: tan x - x + c
○ D: None of the above.

11. $\int [f(x)]^{-1} f'(x)dx$ = ? (f(x) > 0)

○ A: f(x) + c
○ B: ln | ln f(x) | +c
○ C: ln f(x) + c
○ D: $[f(x)]^{n+1} / (n+1)$

12. $\int_1^2 (2x^5 - x + 3)dx \;\; =?$

○ A: 45/2
○ B: 39/2
○ C: 17/2
○ D: None of the above.

13. ∫ dx/(ax + b) =?

○ A: ln|ax + b| + c
○ B: 1/a ln|ax + b| + c
○ C: 1/b ln|ax + b| + c
○ D: 1/a ln|a| + c

14. Which of the following mathematical function gives the area under the curve?

○ A: Differentiation
○ B: Integration
○ C: Vector product
○ D: Both B and C.

15. $\int x\, sinx\, dx \;\; =?$

○ A: x sin x + cos x + c
○ B: - x sin x + cos x + c
○ C: x cos x + sin x + c
○ D: - x cos x + sin x + c

16. $\int \frac{x}{(1+x^4)} dx =$

○ A: $\tan^{-1} x^2$ + c
○ B: 1/2 $\tan^{-1} x^2$ + c
○ C: $\cot^{-1} x^2$ + c
○ D: 1/2 $\cot^{-1} x^2$ + c

17. $\int (2x + 3)^{1/2}$ dx = ?

○ A: 1/3 $(2x + 3)^{3/2}$ + c
○ B: 1/2 $(2x + 3)^{3/2}$ + c
○ C: 1/3 $(2x + 3)^{1/2}$ + c
○ D: 2/3 $(2x + 3)^{3/2}$ + c

18. ∫ tan x $\sec^2$x dx = ?

○ A: $\sec^2$x / 2 + c
○ B: $\tan^2$x / 2 + c
○ C: $\tan^2$x
○ D: 1/2 $(\cos x)^2$

19. What is the solution of the equation?

(sin y) (cosec x) dy/dx = 1

○ A: sin y = sin x + c
○ B: sin y = - sin x + c
○ C: cos y = cos x + c
○ D: cos y = - cos x + c

TEST 2

1. $\int \frac{1-x^2}{1+x^2}dx$ **= ?**

○ A: x + Tan^{-1} x + c
○ B: x - Tan^{-1} x + c
○ C: -x + 2Tan^{-1} x + c
○ D: -x - 2Tan^{-1} x + c

2. $\int_1^4 \left(\sqrt{x}+\frac{1}{\sqrt{x}}\right) dx \ \ =?$

○ A: 20/3
○ B: 14/3
○ C: 8/3
○ D: 5/3

3. **The family of curve y = Ax + A^3 is represented by the differential equation of degree?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

4. $\int \frac{\cos x - \sin x}{\cos x + \sin x}dx \ \ =?$

○ A: - ln (cos x - sin x) + c
○ B: - ln (cos x + sin x) + c
○ C: ln (cos x - sin x) + c
○ D: ln (cos x + sin x) + c

5. $\int \frac{\cos x}{\sqrt{1+\sin x}}dx = ?$

○ A: - $(1+\sin x)^{1/2}$ + c
○ B: $2(1+\sin x)^{1/2}$ + c
○ C: 0.5 $(1+\sin x)^{1/2}$ + c
○ D: - 0.5 $(1+\sin x)^{1/2}$ + c

6. **$\int a^{\lambda x + y}$ dx =?**

○ A: 1/(λ ln a) $a^{\lambda x + y}$ + c
○ B: 1/(ln a) $a^{\lambda x + y}$ + c
○ C: 1/(λ ln a) $a^{x + y}$ + c
○ D: 1/(ln a) $a^{x + y}$ + c

7. **The order of a differential equation whose solution is y = a cos x + b sin x, where a and b are arbitrary constants, is?**

○ A: 1
○ B: 2
○ C: 3
○ D: Cannot be determined.

8. **$\int$ x ln x dx = ?**

○ A: 0.5 x^2 (ln x - 0.5) + c
○ B: x^2 (ln x + 0.5) + c
○ C: 1.5 x (ln x + 1) + c
○ D: x^2 (ln x - x) + c

9. **The order and the degree of the differential equation $d^2s/dt^2 + 4 = 0$ are?**

○ A: Order is 2 and degree is 2
○ B: Order is 2 and degree is 3
○ C: Order is 1 and degree is 2
○ D: None of the above.

10. **$\int$ ln (tan x) $\sec^2$ x dx = ?**

○ A: ln (tan x) + tan x + c
○ B: tan x ln (tan x) - tan x + c
○ C: ln (tan x) - sec x + c
○ D: tan x ln (tan x) + tan x + c

11. $\int \frac{1-\tan^2 x}{1+\tan^2 x} dx =$

○ A: sin 2x

○ B: 1/2 sin 2x

○ C: cos 2x

○ D: 1/2 cos 2x

12. The solution of the differential equation $\frac{dy}{dx} + \frac{1+\cos 2y}{1-\cos 2x} = 0$ is

○ A: tan y + cot x = c

○ B: tan y . cot x = c

○ C: tan y - cot x = c

○ D: tan y = c . cot x

13. Which of the following is an ordinary differential equation?

○ A: $2y + 8x = \frac{d(cosx)}{dx}$

○ B: $\frac{d(y+x)}{dx} = x^2 + sin\,x$

○ C: $\frac{d(cos\,x + tan\,x)}{dx} = x + 2y$

○ D: All of the above.

14. $\int$ **sec^{2}x cosec^{2}x dx = ?**

○ A: tan x cot x

○ B: tan x + cot x

○ C: tan x - cot x

○ D: - tan x cot x

15. $\int$ **tan^2 x dx = ?**

○ A: tan x + x + c

○ B: tan x - x + c

○ C: sec^2 x - x + c

○ D: cosec^2 x + x + c

16. $\int \frac{1}{(1+x^2)Tan^{-1}x} dx \ =?$

○ A: 1/x ln |Tan^{-1} x| + c

○ B: -1/x ln |Tan^{-1} x| + c

○ C: - ln |Tan^{-1} x| + c

○ D: ln |Tan^{-1} x| + c

17. The solution of the differential equation y dy/dx = x - 1, satisfying x = 1 and y = 1, is?

○ A: $y^2 = 2x^2 - x – 1$

○ B: $y^2 = x^2 - 2x + 2$

○ C: $y = x^2 - 2x + 3$

○ D: $y^2 = 2x^2 - x - 3$

18. $\int ln\,x\,dx \ =?$

○ A: x (1 – ln x) + C

○ B: x (ln x - 1) + C

○ C: (1 + x) ln x + C

○ D: (1 - x) ln x + C

19. A particle moves in a straight line with a velocity given by dx/dt = x + 1 (x is the distance described). The time taken by a particle to traverse a distance of 99 meters is?

○ A: log 10e

○ B: 2 log$_e$ 10

○ C: 2 log 10 e

○ D: 0.05 log10 e

20. The number of arbitrary constants in the second order differential euqation is?

○ A: 0

○ B: 1

○ C: 2

○ D: Infinite

TEST 3

1. $\int \frac{cos2x - 1}{1 + cos2x} dx \ =?$

○ A: - tan x + x + c ○ B: tan x + x + c
○ C: x - sec x + c ○ D: x + sec x + c

2. $\int e^{-ln\, x}\, dx \ =?$

○ A: $e^{-\ln x}$ ○ B: ln |x|
○ C: $-e^{-\ln x}$ ○ D: $-x\, e^{-\ln x}$

3. $\int_0^1 \frac{dx}{(1+x^2)^{3/2}} \ =?$

○ A: 1 ○ B: √2
○ C: 1/√2 ○ D: 3/√2

4. The solution of the equation $(e^x + 1)y\, dy = (y + 1)e^x\, dx$ is ?

○ A: $y = e^x(e^x + 1) + C$ ○ B: $(y + 1) = e^{2x} + C$
○ C: $y = e^x / x + C$ ○ D: $C\,(1 + y)(1 + e^x) = e^y$

5. The differential equation of all circles of radius 'r' is of order?

○ A: 1 ○ B: 2
○ C: 3 ○ D: 4

6. What is the solution of the differential equation,

$(x\sqrt{1+y^2})dx + (y\sqrt{1+x^2})dy = 0$

○ A: $(1+y^2)^{1/2} + (1 + x^2)^{1/2} = c$ ○ B: $\log(1 + y^2) + \log(1 + x^2) = 2c$
○ C: $\sin^{-1} y + \sin^{-1} x = c$ ○ D: $\tan^{-1} y + \tan^{-1} x = c$

7. $\int \frac{e^{tan^{-1}x} dx}{1+x^2}$ **= ?**

○ A: $xe^{tan^{-1}x} + c$ ○ B: $(tan^{-1}x)e^{tan^{-1}x} + c$
○ C: $tan^{-1}x + c$ ○ D: $e^{tan^{-1}x} + c$

8. $\int_0^{2\pi} cos^2\theta\, d\theta \ =?$

○ A: π ○ B: 2π
○ C: 3π/2 ○ D: 3

9. $\int_0^{\pi} \sqrt{1 + sin\, x}\, dx \ =?$

○ A: 2 ○ B: 4
○ C: √2 ○ D: 2√2

10. $\int |x|\, dx = ?$

○ A: $x^2 / 2$

○ B: $- x^2 / 2$

○ C: $x |x| / 2$

○ D: 1

11. $\int \frac{\sec x \ \mathrm{cosec}\ x}{\log \tan x} dx =$

○ A: log [log tan x] + C

○ B: cot (log x) + C

○ C: tan (log x) + C

○ D: None of the above.

12. If $\int x^6 \sin(5x^7) dx = \frac{k}{5} \cos(5x^7),\ x \neq 0$, then

○ A: k = -1/7

○ B: k = 1/7

○ C: k = -7

○ D: k = 7

13. $\int \frac{dx}{e^x + e^{-x}} \quad =?$

○ A: $\log (e^x + 1) + C$

○ B: $\log (e^x + e^{-x}) + C$

○ C: $\tan^{-1} e^x + C$

○ D: $\sin^{-1} e^x + C$

14. The value of $\int \frac{(x - x^3)^{1/3}}{x^4} dx$ is

○ A: $(3/8)\,(1/x^2 - 1)^{4/3} + C$

○ B: $- (3/8)\,[(1/x^2) - 1]^{4/3} + C$

○ C: $(1/8)\,(1 - 1/x^2)^{4/3} + C$

○ D: $- (1/8)\,(1 - 1/x^2)^{4/3} + C$

15. $\int \frac{\cos x}{\sin x\,.\,\ln \sin x} dx \quad =?$

○ A: - ln |ln sin x| dx

○ B: - ln |ln cos x| dx

○ C: ln |ln sin x| dx

○ D: ln |ln cos x| dx

16. $\int_0^{2\pi} \sqrt{1 + \sin(x/2)}\, dx \quad =?$

○ A: 2

○ B: 4

○ C: 8

○ D: 0

17. $\int \sin^{-1} x\, dx \quad =?$

○ A: $x \cos^{-1} x + (1 - x^2)^{1/2} + C$

○ B: $x \sin^{-1} x + C$

○ C: $x \sin^{-1} x + (1 - x^2)^{1/2} + C$

○ D: $- \sin^{-1} x + (1 - x^2)^{1/2} + C$

18. $\int_0^{\pi/2} \sin x\, e^{\cos x} dx \quad =?$

○ A: 1

○ B: e - 1

○ C: e

○ D: -1

19. $\int \frac{xe^x}{(1+x)^2}dx \;=?$

○ A: $(1 + 2x\, e^x) / (1 + x)$
○ B: $(1 - 2x\, e^x) / (1 + x)$
○ C: $- e^x / (1+x)$
○ D: $e^x / (1+x)$

20. The equation of the curve through the point (1, 0) and whose slope is $\frac{y - 1}{x^2 - x}$ is

○ A: $(y - 1)(x + 1) + 2x = 0$
○ B: $2x(y - 1) + x + 1 = 0$
○ C: $x(y - 1)(x + 1) + 2 = 0$
○ D: $y(y - 1)(x - 1) + 2 = 0$

TEST 4

1. $\int \sqrt{1 + cos(x/4)}\, dx \;=?$

○ A: 8 √2 sin (x/8) + C
○ B: - 8 √2 sin (x/8) + C
○ C: 8 √2 cos (x/8) + C
○ D: - 8 √2 cos (x/8) + C

2. $\int_0^{\pi/2} sin^2 x\, dx \;=?$

○ A: π
○ B: π/2
○ C: π/3
○ D: π/4

3. $\int_0^{\pi} \sqrt{1 - cos\, x}\, dx \;=?$

○ A: 1
○ B: √2
○ C: 2√2
○ D: 2

4. $\int_0^{\pi/2} sin(x) sin(2x) dx \;=?$

○ A: 1/3
○ B: 2/3
○ C: 1
○ D: pi

5. Which of the following statement is false?

○ A: The degree of the differential equation is the highest power of the highest order differential coefficient occurring in it.
○ B: The order of the differential equation is the highest order derivative occurring in the equation.
○ C: The order of a differential equation is unique.
○ D: The order of a differential equation is any integer.

6. ∫ cos √x dx = ?

○ A: [√ x sin √x + cos √x] + C
○ B: 2[√x sin √x + cos √x] + C
○ C: [√ x sin √x - cos √x] + C
○ D: 2[√x sin √x - cos √x] + C

7. The differential equation $x\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y = x^2$ is of

○ A: Degree 4 and order 2
○ B: Degree 4 and order 3
○ C: Degree 3 and order 2
○ D: Degree 2 and order 3

8. What is the solution of the differential equation?

$x\,dy + y(x - 1)dx = 0$

○ A: $y = c\,xe^{x}$
○ B: $y = c\,xe^{-x}$
○ C: $y = c\,e^{-x}$
○ D: $y = c\,xe^{x+1}$

9. $\int [f(x)]^n f'(x)\,dx = ?$

○ A: $\ln f(x) + c$
○ B: $-\ln f(x) + c$
○ C: $[f(x)]^{n+1} / (n+1)$
○ D: $[f(x)]^{n} / (n+1)$

10. $\int x^2 e^{x^3} \cos(e^{x^3})dx$ is equal to

○ A: $\frac{1}{3} sin(e^{x^3}) + c$
○ B: $sin(e^{x^3}) + c$
○ C: $3sin(e^{x^3}) + c$
○ D: $-sin(e^{x^3}) + c$

11. If $dr/dt = -rt$ and $r(0) = r_0$, then which of the following is correct?

○ A: $r = r_o e^{-t}$
○ B: $r = r_o e^{-t/2}$
○ C: $r = r_o e^{-t.t}$
○ D: $r = r_o e^{-t.t/2}$

12. $\int \frac{e^{2x} + e^x}{e^x} dx \;=?$

○ A: $e^x + 1 + c$
○ B: $2x\,e^x + c$
○ C: $e^{2x} + 1 + c$
○ D: $e^x + x + c$

13. δy for any function $f(x)$ is given by?

○ A: $f(\delta x)$
○ B: $f(x + \delta x)$
○ C: $f(x + \delta x) + f(x)$
○ D: $f(x + \delta x) - f(x)$

14. $\int_0^{\pi/2} cos^2 x\,dx \;=?$

○ A: π
○ B: $\pi/2$
○ C: $\pi/3$
○ D: $\pi/4$

15. The solution of the equation $y\,dx + x\,dy = 0$ is?

○ A: $xy = c$
○ B: $x/y = c$
○ C: $x + y = c$
○ D: $x - y = c$

Analytic Geometry

TEST 1

1. Equation of a line parallel to x axis at a distance 'a' below the x axis is?

○ A: $x = a$
○ B: $x = -a$
○ C: $y = -a$
○ D: $y = a$

2. What is the equation of a line perpendicular to a line with slope = -6? The line has y intercept of 4/3.

○ A: $y = x + 8$
○ B: $y = -6x + 4/3$
○ C: $6y = x + 8$
○ D: $y = x + 3/4$

3. The angle bisectors of a triangle are?

○ A: Perpendicular
○ B: Concurrent
○ C: Non-concurrent
○ D: Parallel

4. The equation of family of lines perpendicular to line $3x + 4y + 7 = 0$, is?

○ A: $4x + 3y + k = 0$
○ B: $4x - 3y + k = 0$
○ C: $3x - 4y + k = 0$
○ D: $3x + 4y + k = 0$

5. If m_1 and m_2 are the slopes of the perpendicular lines. Which of the following is true?

○ A: $m_1 = m$
○ B: $m_1 = - m_2$
○ C: $m_1m_2 - 1 = 0$
○ D: $m_1m_2 + 1 = 0$

6. Angle between lines $2x^2 - 7xy + 3y^2 = 0$, is?

○ A: 45°
○ B: 60°
○ C: 90°
○ D: 30°

7. What is the distance between the points A (7,5) and B (2,-6) ?

○ A: $\sqrt{73}$
○ B: $\sqrt{146}$
○ C: $\sqrt{183}$
○ D: $\sqrt{219}$

8. Equation of x axis is?

○ A: $y = 0$
○ B: $x = 0$
○ C: $x = y$
○ D: $y = 1$

9. What is the y intercept of the line $x - \sqrt{3}y + 10 = 0$

○ A: $10/\sqrt{3}$
○ B: $-10/\sqrt{3}$
○ C: 10
○ D: -10

10. The mid point of line joining points A (3 ,1) and B(-2,-4) is?

○ A: (5/2 , 5/2)
○ B: (3/2, 1/2)
○ C: (-1, -2)
○ D: (1/2 , -3/2)

11. If inclination of a line is 45° then the slope is?

○ A: 0
○ B: 1
○ C: -1
○ D: Infinity.

12. The point (-4,-2) lies on a circle. What is the length of the radius of this circle if the center is located at (-8,-10)?

○ A: $\sqrt{47}$
○ B: $\sqrt{80}$
○ C: $\sqrt{95}$
○ D: $\sqrt{108}$

13. If two medians of a triangle ABC pass through point (1,-2) then the third median pass through?

○ A: (0,0)
○ B: (-2,1)
○ C: (-1,-2)
○ D: None of the above.

14. Which of the following statement is true about any triangle?

○ A: Altitudes and right bisectors are concurrent.
○ B: Altitudes and right bisectors are non-concurrent.
○ C: Altitudes are concurrent and right bisectors are not concurrent.
○ D: Altitudes are not concurrent and right bisectors are concurrent.

15. If m_1 and m_2 are the slopes of two lines then the tangent of angle between the lines is equal to?

○ A: $(m_2 - m_1) / (1 - m_1m_2)$
○ B: $(m_2 + m_1) / (1+m_1m_2)$
○ C: $(m_2 + m_1) / (1 - m_1m_2)$
○ D: $(m_2 - m_1) / (1+m_1m_2)$

16. In the straight equation x cos a + y sin a = P, P represents?

○ A: Y intercept
○ B: X intercept
○ C: Mid point of the line.
○ D: Length of perpendicular from the origin to the line

17. What is the point of intersection for $5x + 7y = 35$ and $3x - 7y = 21$?

○ A: (5,7)
○ B: (7,0)
○ C: (3,-7)
○ D: (4,3)

18. If points A(a,b) ; B(c,d) and C(e,f) are collinear. Then the area of the triangle ABC is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

19. The point p (x,y) such that $x>0$ and $y<0$ lies in?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

20. What is the slope of the line $ax + by + c = 0$?

○ A: 0
○ B: Infinite
○ C: -c/b
○ D: -a/b

TEST 2

1. **What is the symmetric form of the equation 5x - 12y + 39 = 0?**

○ A: $\dfrac{x+39/5}{12/13} = \dfrac{y}{5/13}$
○ B: (-5/13)x + (12/13) y = 3
○ C: (-5/39)x + (12/39) y = 1
○ D: y = (5/12) x + (39/12)

2. **The equation of line parallel to x-axis and bisecting the join of (1, 4) and (− 2, 6) is?**

○ A: y = 3
○ B: y = 5
○ C: y + 2 = 5
○ D: x = 5

3. **What is the equation of a line passing through the point (4,2) and parallel to the line connecting points (0,-1) and (7,-15)?**

○ A: y + 2x + 10 = 0
○ B: y + 2x - 10 = 0
○ C: 2y + 3x - 7 = 0
○ D: 2y + 3x + 7 = 0

4. **The two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if?**

○ A: $a_1b_2 - a_2b_1 = 0$
○ B: $a_1a_2 - b_1b_2 = 0$
○ C: $a_1b_2 + a_2b_1 = 0$
○ D: $a_1a_2 + b_1b_2 = 0$

5. **The three lines $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if and only if?**

○ A: $a_1 = a_2 = a_3$ and $b_1 = b_2 = b_3$ and $c_1 = c_2 = c_3$
○ B: $a_1 + b_1 + c_1 = 0$
○ C:
○ D:

6. **If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then?**

○ A: a = 0, b = 4
○ B: a = 3, b = 4
○ C: a = 2, b = 3
○ D: a = 3, b = 5

7. **The equation of general form $ax^2 + 2hxy + by^2$ represents?**

○ A: A line
○ B: A curve
○ C: A pair of lines
○ D: A pair of lines through the origin

8. **Centroid of a triangle divides each median in the ratio?**

○ A: 1:1
○ B: 1:2
○ C: 2:1
○ D: 1:3

9. **Find the radius of a circle whose diameter has endpoints (-3, -2) and (7, 8)?**

○ A: $10\sqrt{2}$
○ B: $2\sqrt{10}$
○ C: $5\sqrt{2}$
○ D: $2\sqrt{5}$

10. **The angle between the pair of lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$ is?**

○ A: None of the above.
○ B: $\tan^{-1}(4/3)$
○ C: $\tan^{-1}(11/3)$
○ D: $\tan^{-1}(7/3)$

11. Of $P_1(x_1,y_1)$ and $P_2=(x_2,y_2)$ are two points such that line joining P_1P_2 is parallel to x axis then?

○ A: $x_1 = x_2$
○ B: $y_1 = x_2$
○ C: $x_1 = y_2$
○ D: $y_1 = y_2$

12. The equation of a straight line that intersects x axis at point 2 and y axis at point -4 is?

○ A: $y - 2x + 4 = 0$
○ B: $y - 2x - 4 = 0$
○ C: $2x - y + 4 = 0$
○ D: $x - 2y + 4 = 0$

13. For a pair of lines represented by general equation $ax^2 + 2hxy + by^2$, if $h^2 > ab$ then?

○ A: Lines are real and distinct.
○ B: Lines are real and coincident.
○ C: Lines are imaginary.
○ D: Lines do not pass through the origin.

14. What is the equation of the line intersecting $3x - 4y - 10 = 0$ and $x + 2y - 10 = 0$ and having a zero slope?

○ A: $2x + 3y - 18 = 0$
○ B: $y = 2$
○ C: $x = 9$
○ D: $2x + 3y + 18 = 0$

15. Slope of a line is negative if the angle z it froms with the x axis is?

○ A: $z = 0$
○ B: $z > 90$
○ C: $0 < z < 90$
○ D: $90 < z < 180$

16. If three points A(a,b), B(c,d) and C(e,f) are collinear then?

○ A: Slope of AB is not equal to the slope of BC
○ B: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$
○ C: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 1$
○ D: None of the above.

17. The equation below shows which form of the straight line equation?

$$\frac{x - x_1}{\cos\alpha} = \frac{y - y_1}{\sin\alpha}$$

○ A: Normal form
○ B: Two point form
○ C: Symmetric form
○ D: Point slope form

18. What is the distance between two parallel lines $2x - 5y + 13 = 0$ and $2x - 5y + 6 = 0$?

○ A: 3/28
○ B: 9/32
○ C: $7/\sqrt{29}$
○ D: $4/\sqrt{63}$

19. What is the normal form of the straight line equation $5x - 12y + 39 = 0$?

○ A: This equation cannot be represented in the two point form.
○ B: $y = (5/12)\,x + 39/12$
○ C: $(-5/39)\,x + (12/39)\,y = 1$
○ D: $(-5/13)\,x + (12/13)\,y = 3$

20. The points of line $|x| = |y|$ may lie in which quadrant?

○ A: Quadrant I
○ B: Quadrant I & III
○ C: Quadrant II and IV
○ D: Quadrant I, II , III or IV

TEST 3

1. Find the value of k in the equation (3x - 4y - 10) + k(x + 2y - 10) = 0 such that the line is perpendicular to a line with slope 3/4?

○ A: 4 ○ B: 5

○ C: 6 ○ D: 7

2. The pair of lines represented by the equation $2x^2 + 49xy - 2y^2$are?

○ A: Imaginary. ○ B: Parallel

○ C: Perpendicular ○ D: None of the above.

3. The straight lines given below form what kind of triangle?

x + y - 4 = 0, 3x + y - 4 = 0, x + 3y - 4 = 0

○ A: Isoceles ○ B: Equlateral

○ C: Right angled ○ D: None of the above.

4. Pair of lines represented by the equation $2x^2 + 8xy + 8y^2$ are?

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imginary. ○ D: None of the above.

5. What is the value of h such that points (-1,h) , (3,2) and (7,3) are collinear?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. The lines px + qy + r = 0, qx + ry + p = 0, rx + py + q = 0 are concurrent if?

○ A: p + q + r = 0 ○ B: $p^2 + q^2 + r^2 + pq + qr + rp = 0$

○ C: $p^2 + q^2 + r^2 + 3pqr = 0$ ○ D: All of the above.

7. The equation of base of an equilateral triangle is x + y = 2 and the vertex opposite to this base is (2, − 1). Then the length of the side of triangle equals?

○ A: √3 ○ B: √1 / √3

○ C: √2 / √3 ○ D: √3 / √2

8. For a pair of Imaginary lines represented by the equation $ax^2 + 2hxy + by^2$. Which of the following is true?

○ A: The imaginary lines never intersect.

○ B: They intersect at (0,0) ○ C: They intersect at postivie y axis.

○ D: They intersect at negative y axis.

9. If vertices of triangle ABC are A(2,2), B(-4,-4) and C(5,-8). Then the length of median through C is?

○ A: √65 ○ B: √75

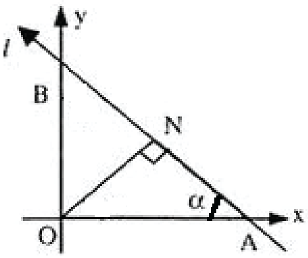
○ C: √85 ○ D: √95

10. For a pair of lines represented by the equation $3x^2 + 4xy + 9y^2$, the lines are?

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imaginary. ○ D: Not passing through the origin.

11. What the equation of a line at a distance 5 units from the origin, having angle $\alpha = 30^o$ as shown in the figure below?



○ A: $\sqrt{3}x + y = 10$

○ B: $x + \sqrt{3}y = 10$

○ C: $\sqrt{3}x + y = 5$

○ D: $x + \sqrt{3}y = 5$

12. Which of the following is true about the two points (0,0) and (-4,7) with respect to the line $2x - 3y + 6 = 0$?

○ A: They both lie on the line.

○ B: They both lie above the line.

○ C: They both lie below the line.

○ D: They lie on the opposite sides of the line.

13. What is the radius of circle inscribed in the triangle formed by lines $x = 0$, $y = 0$ and $4x + 3y - 24 = 0$?

○ A: 2

○ B: $2\sqrt{2}$

○ C: 3

○ D: 4

14. Equation of the right bisector of the line segment joining points (7,4) and (-1,-2) is?

○ A: $4x + 3y - 10 = 0$

○ B: $4x + 3y - 15 = 0$

○ C: $3x - 4y + 7 = 0$

○ D: $3x - 4y - 7 = 0$

15. The line segment joining the point (-3,-4) and (1,-2) is divided by the y axis in ratio?

○ A: 1:1

○ B: 2:1

○ C: 3:1

○ D: 4:1

16. If the coordinates of the mid point of the triangle are (1,-1), (2,3) and (3,2) then the area of triangle is?

○ A: 3/2

○ B: 9/2

○ C: 6

○ D: 11/2

17. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form which of the following triangles?

○ A: Isoceles

○ B: Equilateral

○ C: Right Angled

○ D: None of the above.

18. **Points A(1, 3) and C(5, 1) are opposite vertices of a rectangle ABCD. If the slope of BD is 2, then its equation is**

○ A: $2x - y = 4$

○ B: $2x + y = 4$

○ C: $2x + y = 7$

○ D: $2x - y = -7$

19. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product then c has the value?

○ A: -1

○ B: 1

○ C: -2

○ D: 2

20. Equation of the line passing through the point (1,-2) and cutting off equal intercepts from the axis would be?

○ A: $x + y = 1$
○ B: $x + y + 1 = 0$
○ C: $x - y = 1$
○ D: $x - y + 1 = 0$

TEST 4

1. For a pair of lines represented by the equation $ax^2 + 2hxy + by^2$, which of the following is true if the lines are parallel?

○ A: $h^2 = 0$
○ B: $h^2 > ab$
○ C: $h^2 < ab$
○ D: $h^2 - ab = 0$

2. If point A (-1,2) is the center of a circle and point B (7,5) lies on the circle. The diameter of circle is?

○ A: 9
○ B: $\sqrt{45}$.
○ C: $\sqrt{73}$.
○ D: $2\sqrt{73}$

3. The coordinate axis is changed through the point O' (2,3). If coordinates of a point P in new axis are (-1,4) then the original coordinates of P were?

○ A: (0,0)
○ B: (2,3)
○ C: (1,7)
○ D: (3,-1)

4. The point P (x,y) with $x<0$ and $y<0$ lies in which quadrant?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

5. What are the new coordinates of the point P(5,3), if the axis is rotated by angle 45°?

○ A: (4,2)
○ B: $(\sqrt{2}, 2\sqrt{2})$
○ C: $(2\sqrt{2}, -\sqrt{2})$
○ D: $(4\sqrt{2}, -\sqrt{2})$

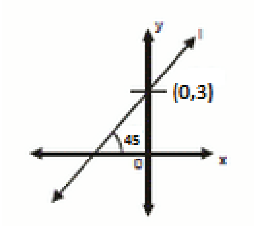
6. Inclination of the line $y = -x$ is?

○ A: 45°
○ B: 135°
○ C: 225°
○ D: 315°

7. What is the angle between the lines L_1 joining points (1,-7) and (6,-4) and L_2 joining points (-1,2) and (-6,-1)?

○ A: 0
○ B: 30
○ C: 45
○ D: 60

8. The equation of the line given below is?



○ A: $y = 3x - 1$
○ B: $y = 3x + 1$
○ C: $y + x = 3$
○ D: $y = x + 3$

9. **Two sides of an isosceles triangle are given by the equation $7x - y + 3 = 0$ and $x + y - 3 = 0$. If its third side passes through the point (1, – 10), then its equations are**

○ A: x - 3y - 31 = 0 or 3x + y + 7 = 0 ○ B: x - y - 31 = 0 or x + y + 7 = 0

○ C: 2x - 3y - 11 = 0 or x + 4y + 9 = 0 ○ D: x + y + 1 = 0 or 5x - y + 10 = 0

10. Equation of the line through the point (2,3) and perpendicular to the line joining (-5,6) and (-6,5) is given by?

○ A: x - y + 5 = 0 ○ B: x + y + 5 = 0

○ C: x - y - 5 = 0 ○ D: x + y - 5 = 0

11. The extremities of diagonal of a parallelogram are the points (3, − 4) and (− 6, 5). If the third vertex is (− 2, 1), then the fourth vertex will be?

○ A: (0,1) ○ B: (1,0)

○ C: (1,1) ○ D: (-1,0)

12. Orthocenter of a triangle is defined as the point of intersection of?

○ A: Altitudes ○ B: Angle bisectors

○ C: Medians ○ D: None of the above.

13. If the lines represented by equation $Ax^2 + 2Hxy + By^2 = 0$ are perpendicular, then?

○ A: A + H = 0 ○ B: A + B = 0

○ C: H = 0 ○ D: A/B = H/B

14. What is the equation of the lines passing through the point (-5,-3) and (9,-1) ?

○ A: x - 7y - 16 = 0 ○ B: x - 7y + 16 = 0

○ C: x + 7y + 16 = 0 ○ D: x + 7y - 20 = 0

15. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. Then PQRS must be a?

○ A: General parallelogram ○ B: Rectangle

○ C: Rhombus ○ D: None of the above.

16. A line passes through point (4, 1) and is perpendicular to line 3x + y = 3, then its x − intercept is?

○ A: ½ ○ B: 2/3

○ C: 1 ○ D: 3/2

17. The line passing through point (1,2) and perpendicular to x + y + 1 = 0 is?

○ A: y - x + 1 = 0 ○ B: y - x - 1 = 0

○ C: y - x + 2 = 0 ○ D: y - x - 2 = 0

18. Distance between two lines defined by x + 3 = 0 and x - 3 = 0 is?

○ A: 0 ○ B: 3

○ C: 6 ○ D: 9

19. M is the midpoint of line AB. The coordinates of A are (-2,3) and the coordinates of M are (1,0). The coordinates of B are?

○ A: (-1/2,3/2)
○ B: (4,-3)
○ C: (4,6)
○ D: (-4,-3)

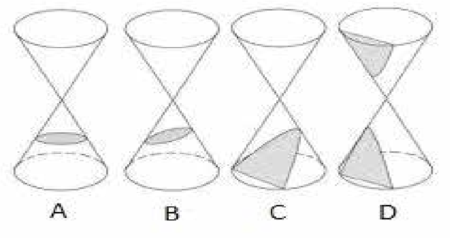
20. If a line passing through the points (x_1 , y_1) and (x_2 , y_2) such that $x_1 = x_2$ then the slope of the line is?

○ A: Zero
○ B: Positive
○ C: Negative
○ D: Undefined

Conic Sections

TEST 1

1. **Which of the following cutting of a cone represents a circle?**



○ A: A

○ B: B

○ C: C

○ D: D

2. **Eccentricity of ellipse is?**

○ A: Equal to 1.

○ B: Greater than zero and less than 1.

○ C: Greater than one.

○ D: Zero

3. **Center and radius of the circle represented by $x^2 + y^2 = 9$ is?**

○ A: (1,1) and 9

○ B: (1,1) and 3

○ C: (0,0) and 9

○ D: (0,0) and 3

4. **Equation of a circle cannot have a term?**

○ A: x

○ B: y

○ C: xy

○ D: All of the above.

5. **The center of the circle represented by the equation $(x - 3)^2 + (y + 4)^2 = 4$ is?**

○ A: (3,4)

○ B: (-3,-4)

○ C: (-3,4)

○ D: (3,-4)

6. **What is the focus of the ellipse $x^2/16 + y^2/4 = 1$?**

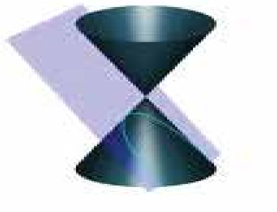
○ A: $(\pm 2\sqrt{3}, 0)$

○ B: $(\pm \sqrt{3}, 0)$.

○ C: $(\pm 2\sqrt{5}, 0)$.

○ D: $(\pm \sqrt{5}, 0)$.

7. **The plane cutting a double cone as shown in the figure below would get a/an?**



○ A: Circle

○ B: Parabola

○ C: Hyperbola

○ D: Ellipse

8. **The equation $x^2/a^2 + y^2/b^2 = 1$ represents a verticle ellipse if?**

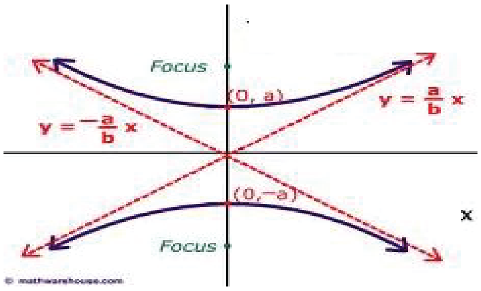
○ A: $a^2 = b^2$

○ B: $a^2 < b^2$

○ C: $a^2 > b^2$

○ D: None of the above.

9. The equation of the given hyperbola is of form?



○ A: $x^2/a^2 + y^2/b^2 = 1$

○ B: $x^2/b^2 + y^2/a^2 = 1$

○ C: $x^2/a^2 - y^2/b^2 = 1$

○ D: $y^2/a^2 - x^2/b^2 = 1$

10. When the cutting of a conic section is parallel to the axis of the cone and intersects both nappes, it represents a/an?

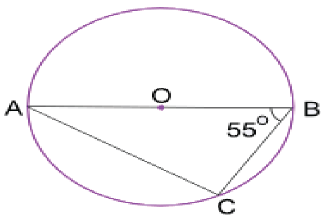
○ A: Circle

○ B: Parabola

○ C: Hyperbola

○ D: Ellipse

11. What is angle CAB in the given figure?



○ A: 35°

○ B: 45°

○ C: 55°

○ D: 65°

12. A line $y = mx + c$ intersects a circle $x^2 + y^2 = a^2$. The point of intersection are imaginary if?

○ A: $a^2 (1+m^2) - c^2 > 0$

○ B: $a^2 (1+m^2) - c^2 = 0$

○ C: $a^2 (1+m^2) - c^2 < 0$

○ D: Intersection points are never imaginary.

13. If a circle is represented by the equation $x^2 + y^2 + 4x - 6y - 12 = 0$. Then the point (-5,6) is?

○ A: Inside the circle

○ B: Outside the circle.

○ C: On the circle.

○ D: Center of the circle.

14. Circle is a special case of ellipse with eccentricity = ?

○ A: -1

○ B: 0

○ C: 1

○ D: 2

15. The parametric form of equation (a cos Θ, b sin Θ) is for?

○ A: Circle

○ B: Hyperbola

○ C: Ellipse

○ D: Parabola

16. Equation of the directrices of hyperbola $y^2/a^2 - x^2/b^2 = 1$ is given by?

○ A: $x = \pm c/e^2$

○ B: $x = \pm b/e$

○ C: $y = \pm c/e^2$

○ D: $y = \pm b/e$

17. If $e > 1$ then the conic section is a?

○ A: Parabols ○ B: Ellipse

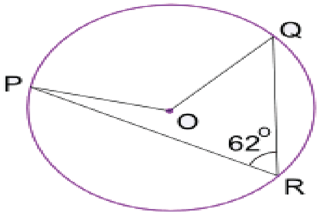
○ C: Hyperbola ○ D: Circle.

18. If a plane cutting one section of a double cone is slightly tilted and not parallel to the generator of the cone, we get a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

19. What is the angle POQ in the given diagram?



○ A: 62° ○ B: 102°

○ C: 124° ○ D: 132°

20. Focal chord perpendicular to the axis of the parabola is called?

○ A: Directrix. ○ B: Tangent Chord

○ C: Latusrectum. ○ D: Vertex.

TEST 2

1. **For a general form of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius is given by**?

○ A: $g + f + c$ ○ B: $\sqrt{g^2 + f^2}$

○ C: $\sqrt{g^2 + f^2 - c}$ ○ D: $\sqrt{g^2 + f^2 + c}$

What is the eccentricity of the ellipse given by equation $x^2/9 + y^2/4 = 1$?

○ A: 5/3 ○ B: √5/3

○ C: 2/3 ○ D: √2/3

2. **The equations $x = at^2$, $y = at$; $t \in R$ represents?**

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

3. **Intersecting properties of conic sections were discovered by?**

○ A: Pythagoras ○ B: Eudoxus and Georg Cantor

○ C: Euclid ○ D: Apollonius and Pappus

4. **What are the coordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$?**

○ A: (2,-1) ○ B: (2,1)

○ C: (-2,-1) ○ D: (2,0)

5. **What is the focus of the parabola $4x - y^2 = 2y + 13$?**

○ A: (3,-1) ○ B: (3,1)

○ C: (4, 1) ○ D: (4, -1)

6. What are the foci of hyperbola $x^2/9 - y^2/4 = 1$?

○ A: $(\pm\sqrt{5}, 0)$ ○ B: $(0, \pm\sqrt{5})$

○ C: $(0, \pm\sqrt{13})$ ○ D: $(\pm\sqrt{13}, 0)$

7. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x-a)$ is?

○ A: 90° ○ B: 60°

○ C: 45° ○ D: 30°

8. Equation of a line tangent to ellipse at $x^2/a^2 + y^2/b^2 = 1$ at points (4,10) is?

○ A: $4x/a^2 + 10y/b^2 = 1$ ○ B: $10x/a^2 + 4y/b^2 = 1$

○ C: $16x/a^2 + 100y/b^2 = 1$ ○ D: $100x/a^2 + 16y/b^2 = 1$

9. The line $y = 2x + c$ is tangent to the ellipse $x^2/16 + y^2/4 = 1$ if c equals?

○ A: $\sqrt{29}$ ○ B: $\sqrt{60}$

○ C: $\sqrt{68}$ ○ D: $\sqrt{74}$

10. What is the center of the ellipse $x^2 + 4y^2 + 4x - 24y + 24 = 0$?

○ A: (-2,3) ○ B: (-2, -3)

○ C: (2,3) ○ D: (2,-3)

11. Which of the following is not an equation of a circle?

○ A: $x^2 + y^2 - x + 98y + 11 = 4$ ○ B: $x^2 + y^2 + 18x + 98y + 11 = 0$

○ C: $5x^2 + 5y^2 + 14x + 12y - 10 = 0$ ○ D: $x^2 + 3y^2 + 10x - 9y + 11 = 0$

12. Latusrectum of the parabola $y^2 = -4ax$ is?

○ A: $x = a$ ○ B: $x = -a$

○ C: $y = a$ ○ D: $y = -a$

13. The equations $x = a \cos \theta$, $y = b \sin \theta$, $0 \le \theta < 2\pi$, $a \neq b$, represents?

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

14. The vertex of the parabola $(y - a)^2 = 4a (x - a)$ is?

○ A: (0,a) ○ B: (a,0)

○ C: (0,0) ○ D: None of the above.

15. A second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola if?

○ A: $h^2 - ab = 0$ ○ B: $h^2 - ab > 0$

○ C: $h^2 - ab < 0$ ○ D: None of the above.

16. What is the length of the major axis for the ellipse $x^2/16 + y^2/4 = 1$?

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

17. The equation $y = mx + a/m$ is tangent to $y^2 = 4ax$ for m = ?

○ A: 0 ○ B: 1

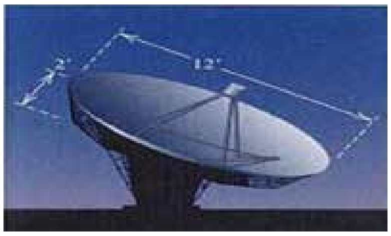
○ C: All positive values ○ D: All nonzero values

18. What is the center of a circle represented by a general form $5x^2 + 5y^2 + 24x + 36y + 10 = 0$?

○ A: (-12/5 , -18/5) ○ B: (12/5 , 18/5)

○ C: (-9/5 , -7/5) ○ D: (9/5 , 7/5)

19. The interior of a satellite dish has diameter 12 ft and 2 ft deep as shown in the figure below. What is the distance from the center of the dish to the focus?



○ A: 4.5 ft
○ B: 5.5 ft
○ C: 6.0 ft.
○ D: 6.2 ft

TEST 3

1. Minimum number of non-collinear points on a circle required to form an equation of a circle are?

○ A: 2
○ B: 3
○ C: 4
○ D: 5

2. The foci of an ellipse are (0, ± 1) and minor axis is of unit length. The equation of the ellipse is ?

○ A: $2x^2 + 4y^2 = 5$
○ B: $4x^2 + 2y^2 = 5$
○ C: $15x^2 + 6y^2 = 1$
○ D: $20x^2 + 4y^2 = 5$

3. The sum of distances of any point on the ellipse $3x^2 + 4y^2 = 24$ from its foci is?

○ A: 8 units
○ B: $2\sqrt{2}$ units
○ C: $4\sqrt{2}$ units
○ D: 7 units

4. The line $y + 2x - 5 = 0$ with respect to the circle $x^2 + y^2 + 2x - 9 = 0$?

○ A: Cuts the circle at two distinct points.
○ B: Tangent to the circle.
○ C: Do not touch the circle.
○ D: None of the above.

5. If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then a is equal to?

○ A: 15/16
○ B: 9/7
○ C: 5/4
○ D: 2/3

6. What is the equation of tangent to the circle $x^2 + y^2 + 5/3\,x - 13/3\,y + 2/3 = 0$ at (1, 10/3)?

○ A: $21x - 33y + 89 = 0$
○ B: $33x + 21y + 157 = 0$
○ C: $8x + 46y - 22 = 0$
○ D: $3x + 19y + 27 = 0$

7. What is the equation of a circle with diameter between two points A (2,3) and B (4,6)?

○ A: $x^2 + y^2 + 3x - 9y - 23 = 0$
○ B: $x^2 + y^2 - 9x - 2y + 11 = 0$
○ C: $x^2 + y^2 - 6x - 9y + 26 = 0$
○ D: Cannot be determined from the given information.

8. If e_1 and e_2 are eccentricities of the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$ and $x^2/b^2 - y^2/a^2 = 1$ then?

○ A: $e_1 = e_2$
○ B: $e_1 * e_2 = 1$
○ C: $e_1 + e_2 = 0$
○ D: $1/e_1^2 + 1/e_2^2 = 1$

9. The line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$ if c equals?

○ A: 2
○ B: 1/2
○ C: 0
○ D: -1/2

10. The equation of the circle whose diameter is the latusrectum of the parabola $x^2 = 4y$ is?

○ A: $x^2 + (y-1)^2 = 4$ ○ B: $(x - 2)^2 + (y - 1)^2 = 4$

○ C: $y^2 + (x-1)^2 = 4$ ○ D: $y^2 + (x-1)^2 = 2$

11. Line y = 2c is a tangent to the parabola $y^2 = 4ax$ if c is equal to?

○ A: 0 ○ B: 4

○ C: 2a ○ D: None of the above.

12. The line 5y + 12x - 39 = 0 to the circle $x^2 + y^2 = 9$?

○ A: Cuts the circle in two distinct points.

○ B: Do not touch the circle ○ C: Is tangent to circle

○ D: Cuts the circle at two imaginary points

13. What is the equation of a circle passing through non collinear points A(5, 8) and B(-2,9)?

○ A: $x^2 + y^2 + 4x - 12y - 20 = 0$ ○ B: $x^2 + y^2 + 4x - 9y - 15 = 0$

○ C: $x^2 + y^2 + 9x - 7y + 3 = 0$ ○ D: Equation cannot be formed from the given information.

14. What is the focus of the ellipse given by the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$?

○ A: (1, ±√5) ○ B: (1,-1±√5)

○ C: (1,1±√5) ○ D: (1±√5, -1)

15. $x = \dfrac{e^t + e^{-t}}{2}, \; y = \dfrac{e^t - e^{-t}}{2}; \; t \in R$ represents

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

16. The line y = mx + 1 is tangent to parabola $y^2 = 4x$ if m = ?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

17. Slope of the normal at point (at^2, 2at) of the parabola $y^2 = 4ax$ is?

○ A: 1/t ○ B: t

○ C: -t ○ D: -1/t

18. What is the equation of the asymptotes for the given hyperbola?

$4x^2 - 9y^2 - 32x - 18y + 19 = 0$.

○ A: (y + 1) = ± 2/3 (x - 4) ○ B: (y + 1) = ± 4/9 (x - 4)

○ C: (y - 1) = ± 2/3 (x + 4) ○ D: (y - 1) = ± 4/9 (x + 4)

19. The general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a hyperbola if?

○ A: $h^2 - ab < 0$ ○ B: $h^2 - ab = 0$

○ C: $h^2 - ab > 0$ ○ D: None of the above.

20. The point on the curve $y^2 = x$, where the tangent line makes an angle of 45° with the x-axis is?

○ A: (3/4,1/2) ○ B: (1/4,1/2)

○ C: (1/4,3/2) ○ D: (1,2)

TEST 4

1. **Parametric form of equation for a cricle is?**

○ A: $(a \sec \Theta, b \tan \Theta)$ ○ B: $(r \cos \Theta, r \sin \Theta)$

○ C: $(a \cos \Theta, b \sin \Theta)$ ○ D: $(at^2 , 2at)$

2. **What is the vertex of the parabola $y = -2x^2 + 4x + 1$?**

○ A: (2,1) ○ B: (-2,-1)

○ C: (-1,-3) ○ D: (1,3)

3. **If one foci of the ellipse is at (-3,0) and the ellipse is centered around the origin. What is the distance between the two foci of the ellipse?**

○ A: Cannot be determined. ○ B: 9

○ C: 6 ○ D: 3

4. **What is the focus of the parabola $y^2 - x - 2y + 2 = 0$?**

○ A: (3/4 , 1) ○ B: (1/4 , 0)

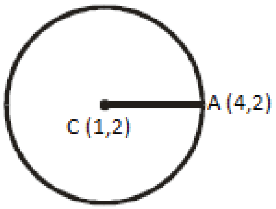
○ C: (1/4 , 1) ○ D: (5/4 , 1)

5. **Axis of the parabola $9y^2 -16x -12y - 57 = 0$ is?**

○ A: 2/3 ○ B: 3/2

○ C: -2/3 ○ D: -3/2

6. **What is the equation of the circle given in the figure below?**



○ A: $(x - 1)^2 + (y - 2)^2 = 16$ ○ B: $(x + 1)^2 + (y + 2)^2 = 9$

○ C: $(x - 1)^2 + (y - 2)^2 = 9$ ○ D: $(x - 1)^2 + (y + 2)^2 = 16$

7. **Parametric form of equation for a parabola is?**

○ A: $(r \cos \Theta, r \sin \Theta)$ ○ B: $(at^2 , 2at)$

○ C: $(a \cos \Theta, b \sin \Theta)$ ○ D: $(a \sec \Theta, b \tan \Theta)$

8. **The equation of the parabola with focus at (0, a) and directrix $y + a = 0$ is $(a > 0)$?**

○ A: $x^2 = 4ay$ ○ B: $x^2 = -4ay$

○ C: $y^2 = 4ax$ ○ D: $y^2 = -4ax$

9. **The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is?**

○ A: (4,4) ○ B: (2,2)

○ C: $(\sqrt{2}, 2)$ ○ D: $(2\sqrt{2}, 2)$

10. **For a general equation $Ax^2 + By^2 + Gx + Fy + C = 0$, if A is not equal to B and both have opposite signs then it represents?**

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

11. The line $y = mx + c$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ if?

○ A: $c = a/m$
○ B: $c^2 = a^2 m^2 + b^2$
○ C: $c^2 = a^2 m^2 - b^2$
○ D: None of the above.

12. If a is the major axis, b is the minor axis and e is the eccentricity of an ellipse. Its directrices are given by?

○ A: $\pm c/e$
○ B: $\pm b/e$
○ C: $\pm a/e$
○ D: $\pm b/e^2$

13. The equation $(y - y_1)(x_1 + g) = (x - x_1)(y_1 + f)$ represents?

○ A: Tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ B: Normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ C: Chord of a circle $x^2 + y^2 + 2gx + 2fy + c = 0$ through point (x_1 , y_1)
○ D: None of the above.

14. If the length of major axis of ellipse is 2a and length of minor axis is 2b. Then the length if latusrectum is approximately?

○ A: $4b/a$
○ B: $4a^2/b$
○ C: $2b^2/a$
○ D: $a/2b$

15. When the cutting of a conic section is perpendicular to the axis of the cone, it represents a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

16. What is the length of the tangent from point (-5, 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$?

○ A: $\sqrt{29}$
○ B: $\sqrt{67}$
○ C: $\sqrt{102}$
○ D: $\sqrt{133}$

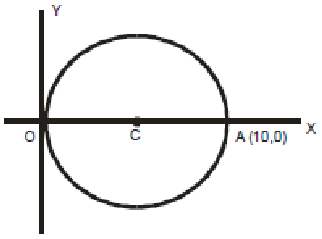
17. From a point P outside a circle, how many tangents can be drawn?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

18. What is the radius of a circle represented by the equation $x^2 + y^2+12x - 10y = 0$?

○ A: $\sqrt{61}$
○ B: $\sqrt{55}$
○ C: $\sqrt{52}$
○ D: $\sqrt{47}$

19. Equation of the circle given in the figure below is?



○ A: $x^2 + y^2 = 25$
○ B: $(x-5)^2 + y^2 = 25$
○ C: $(x + 5)^2 + y^2 = 25$
○ D: $(x + 5)^2 + y^2 = 10$

20. Find the equation of an ellipse with centre (0,0), focus (0,-3) and one vertes at (0,4)?

○ A: $x^2/16 + y^2/7 = 1$
○ B: $x^2/7 + y^2/16 = 1$
○ C: $x^2/\sqrt{7} + y^2/4 = 1$
○ D: $x^2/7 + y^2/4 = 1$

Vectors

TEST 1

1. **What are the direction cosines of unit vector**

$$\hat{\underline{v}} = \left[\frac{6}{\sqrt{41}}, \frac{-2}{\sqrt{41}}, \frac{1}{\sqrt{41}}\right]$$

○ A: 0, 0, 0 ○ B: -6/√41 , +2/√41, -1/√41
○ C: 6/√41 , -2/√41, 1/√41 ○ D: None of the above.

2. **If volume of a parallelepiped with a ,b , c as co-terminus edges is 36 the volume of the tetrahedron with the same edges is?**

○ A: 13 ○ B: 12
○ C: 6 ○ D: 3

3. **Value of [i, i , k] is?**

○ A: 0 ○ B: 1
○ C: -1 ○ D: √-1

4. **The value of 2*i* x 4*k* =?**

○ A: 0 ○ B: 8k
○ C: -8j ○ D: 8j

5. **The volume of the parallelepiped with *u* , *v* and *w* as its coterminus edges is?**

○ A: u.(v x w) ○ B: 1/2 * u.(v x w)
○ C: 1/6 * u.(v x w) ○ D: u x (v x w)

6. **If ā is a unit vector. Then the value of ā.ƃ is? Assume that the two vectos are not perpendicular to each other.**

○ A: 0 ○ B: 1
○ C: ā cos θ ○ D: ƃ cos θ

7. **Which of the following statement is true?**

○ A: Only dot product possesses distributive property
○ B: Only cross product possesses distributive property
○ C: Both dot and cross product possess distributive property
○ D: Neither dot nor cross product possess distributive property

8. **The value of (2*j x i*) - 3*k* = ?**

○ A: -5k ○ B: 5k
○ C: k ○ D: -k

9. **Find the magnitude of vector v = -3i + 4j ?**

○ A: 2 ○ B: 3
○ C: 4 ○ D: 5

10. **If terminal point of a vector coincides with its origin point then it is called?**

○ A: Unit Vector. ○ B: Null Vector.
○ C: Equity Vector. ○ D: Negative Vector.

11. If ā = [1,-3] and ƃ = [2,5] ; 4ā + 2ƃ = ?

○ A: [3,2]
○ B: [8,2]
○ C: [-8,2]
○ D: [8,-2]

12. If ā, ƃ and c are three vectors representing three edges of a parallelepiped. Its volume is given by?

○ A: ā x ƃ x c
○ B: ā . ƃ . c
○ C: ā . (ƃ x c) / 2
○ D: ā . (ƃ x c)

13. If three vectors are coplanar then their scalar triple product is?

○ A: 0
○ B: 1
○ C: -1
○ D: Equal to vector triple product.

14. i.j = ?

○ A: 0
○ B: 1
○ C: -1
○ D: k

15. If ā = i - k and ƃ = j + k then the projection of ā along ƃ is?

○ A: -1/√2
○ B: 1/√2
○ C: 1
○ D: -1

16. If k is a scalar ā x kƃ = ?

○ A: kā x ƃ
○ B: k (ā x ƃ)
○ C: kā x kƃ
○ D: Both A and B.

17. If ā = [2,1,3] and ƃ = [-1,4,0]. What is the magnitude of ā - 2ƃ?

○ A: 16
○ B: √74
○ C: √93
○ D: 36

18. What is the unit vector for v = 3i - j +2k?

○ A: [3/√14 , 1/√14, 2/√14]
○ B: [5/√37 , -2/√37, 7/√37]
○ C: [1/√37 , 8/√37, -3/√37]
○ D: [3/√14 , -1/√14, 2/√14]

19. The position vector of a point P(x, y, z) is denoted by?

○ A: $\overrightarrow{PQ}$
○ B: $\overrightarrow{P}$
○ C: $\overrightarrow{OP}$
○ D: All of the above.

20. k.k =?

○ A: 0
○ B: 1
○ C: -1
○ D: j

TEST 2

1. **If AB = i + j + k, AC = -4k and AD = i +2j - 8k then the volume of tetrahedron ABCD formed by the three vectors is?**

   ○ A: 1 ○ B: 2/3

   ○ C: 2 ○ D: 4

2. **What is the value of α such that αi + j , i + j + 3k and 2i + j - 2k are coplanar?**

   ○ A: 1/3 ○ B: 7/4

   ○ C: 9/5 ○ D: 8/5

3. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors such that $|\vec{b}| = |\vec{c}|$, then $[(\vec{a}+\vec{b}) \times (\vec{a}+\vec{c})] \times (\vec{b} \times \vec{c}) =$

   ○ A: 1 ○ B: -1

   ○ C: 0 ○ D: 2

4. **(2j x 3i).k = ?**

   ○ A: 0 ○ B: 7

   ○ C: 6 ○ D: -6

5. **What is the vector perpendicular to both vectors $\bar{a}$ = 2i - j + k and $\bar{b}$ = 4i + 2j - k?**

   ○ A: -i + 6j + 8k ○ B: -2i + 3j + 9k

   ○ C: 3i + 1j + 7k ○ D: 5i - 3j + k

6. **If $\bar{a}$ = 2i - 4j + 5k and $\bar{b}$ = 4i + xj - 4k. What is the value of x if $\bar{a}$ and $\bar{b}$ are perpendicular to each other?**

   ○ A: -1 ○ B: -2

   ○ C: -3 ○ D: -4

7. **Which of these vectors are parallel?**

   a = 2i + 3j + k, b = 4i + 6j + 2k, c = 6i + 9j + 3k

   ○ A: a and b ○ B: a and c

   ○ C: a, b and c all are parallel to each other.

   ○ D: None of them is parallel.

8. **Unit vector perpendicular to i - j and i + j is?**

   ○ A: k ○ B: -k

   ○ C: (i - j) / 2 ○ D: (i + j) / √2

9. **Which of the following expressions is meaningful?**

   ○ A: u.(v x w) ○ B: (u.v) .w

   ○ C: (u.v) . w ○ D: None of the above.

10. **Zero vector is?**

    ○ A: Parallel to every vector. ○ B: Perpendicular to every vector.

    ○ C: Both parallel and perpendicular to every vector.

    ○ D: Is inverse of every vector.

TEST 3

1. **The point which divides the line joining (2, 4, 5) and (-3, 5, - 4) in the ratio 2 : 3, lies on?**

○ A: XY plane ○ B: YZ plane

○ C: XZ plane ○ D: None of the above.

2. **If result of two forces ā of magnitude (P) and ƃ of magnitude (Q) isperpendicular to ā and has magnitude P. Then the magnitude of ƃ is?**

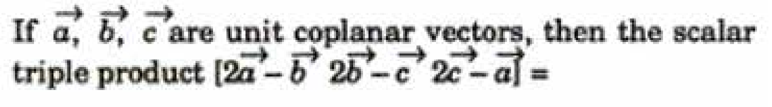
○ A: P ○ B: P√2

○ C: P√3 ○ D: 2P√3

3. **If ā x ƃ = ā x ē then which of the following is true?**

○ A: ā, ƃ and ē are coplanar. ○ B: ā, ƃ and ē are orthogonal

○ C: ƃ = ē ○ D: ā is parallel to ƃ

4. 

If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}\ 2\vec{b}-\vec{c}\ 2\vec{c}-\vec{a}]$ =

○ A: 0 ○ B: 1

○ C: √2 ○ D: √3

5. **If ā, ƃ, ē, ō are the vertices of a square then?**

○ A: ƃ - ā = ē – ƃ ○ B: ā + ƃ + ē = 0

○ C: (ē - ā) . (ō - ƃ) = 0 ○ D: None of the above.

6. **If the vectors a, b and c be the vectors representing the sides AB, BC and CA respectively of a triangle ABC, then?**

○ A: a.(bxc) = 0 ○ B: (a.b) x c = (a.c) x b

○ C: |a x b| = |a x c| = |b x c| ○ D: |a x b| + |b x c| + |c x a| = 0

Position vector a = 2i - 3j and b = 3i + 2j. What are the coordinates of position vector that divides the line between a and b in ration 4:3?

○ A: 11/7 i + 8/7 j ○ B: 1/7 i - 5/7 j

○ C: 18/7 i - 1/7 j ○ D: 23/7 i + 3/7 j

7. **The points (5, 2, 4), (6, −1, 2) and (8, −7, k) are collinear if k is equal to?**

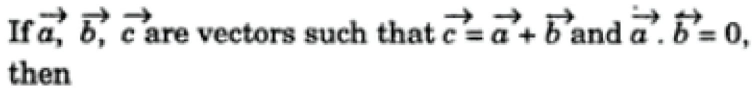
○ A: 3 ○ B: 2

○ C: -1 ○ D: -2

8. **If A (-2,-3), B (1,4), C(0,-5) are three vertices of parallelogram ABCD. What are the coordinates of D if AB is parallel to DC?**

○ A: (3,14) ○ B: (-4,11)

○ C: (-3, -12) ○ D: (-4, 9)

9. 

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{c} = \vec{a} + \vec{b}$ and $\vec{a} \cdot \vec{b} = 0$, then

○ A: $a^2 + b^2 + c^2 = 0$ ○ B: $a^2 - b^2 = c^2$

○ C: $a^2 + b^2 = 0$ ○ D: $c^2 = a^2 + b^2$

10. **The point having position vectors $2\hat{i} + 3\hat{j} + 4\hat{k}$, $3\hat{i} + 4\hat{j} + 2\hat{k}$, $4\hat{i} + 2\hat{j} + 3\hat{k}$ are the vertices of a triangle. The triangle is?**

○ A: Right angled. ○ B: Equilateral.
○ C: Isosceles. ○ D: None of the above.

11. **The points with position vectors $14\hat{i} - 13\hat{j}$, $12\hat{i} - 5\hat{j}$ and $a\,\hat{i} + 11\,\hat{j}$ are collinear if a equals**

○ A: 8 ○ B: 13
○ C: -5 ○ D: -9

12. **Angles α , β and δ are direction angles of a single vector only if?**

○ A: $\cos^2 \alpha = \cos^2 \beta = \cos^2 \delta$ ○ B: $\cos^2 \alpha = \cos^2 \beta + \cos^2 \delta$
○ C: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 0$ ○ D: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 1$

13. **Let $\vec{a} = \hat{i} - \hat{k}$, $\vec{b} = x\hat{i} + \hat{j} + (1 - x)\hat{k}$ and $\vec{c} = y\hat{i} + x\hat{j} + (1 + x - y)\hat{k}$, then $[\vec{a}\ \vec{b}\ \vec{c}]$ depends on**

○ A: Only x ○ B: Only y
○ C: Both x and y ○ D: Neither x nor y

TEST 4

1. **Unit vector in the direction of vector v = [-3,-4] is?**

○ A: -3/5 i - 4/5 j ○ B: -3/5 i + 4/5 j
○ C: 3/5 i - 4/5 j ○ D: 3/5 i + 4/5 j

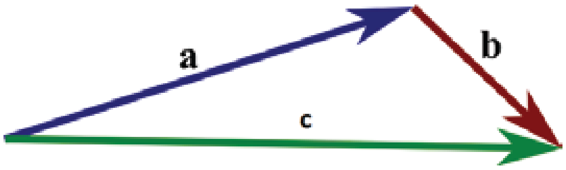
2. **Let a = 2i + j + k, a vector c perpendicular to a is?**

○ A: $\frac{1}{\sqrt{2}}(-j + k)$ ○ B: $\frac{1}{\sqrt{3}}(i + j - k)$
○ C: $\frac{1}{\sqrt{5}}(-i - j - k)$ ○ D: $\frac{1}{\sqrt{2}}(i - 2j)$

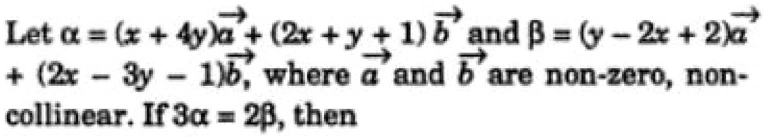
3. **The area (in square units) of the parallelogram whose diagonals are $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} + 4\hat{k}$**

○ A: $\sqrt{7}$ ○ B: $\sqrt{11}$
○ C: $\sqrt{14}$ ○ D: Cannot be determined from the given information.

4. **In the figure below vector b is given by?**



○ A: c + a ○ B: c - a
○ C: a – c ○ D: None of the above.

5. 

Let $\alpha = (x + 4y)\vec{a} + (2x + y + 1)\vec{b}$ and $\beta = (y - 2x + 2)\vec{a} + (2x - 3y - 1)\vec{b}$, where $\vec{a}$ and $\vec{b}$ are non-zero, non-collinear. If $3\alpha = 2\beta$, then

○ A: x= 1, y = -2
○ B: x= -2, y = -1
○ C: x= 2, y = 2
○ D: x= 2, y = -1

6. **For two position vectors ā and б. The coordinates of position vector dividing the line between ā and б in ration 1 : 1 would be?**

○ A: (ā - б) / 2
○ B: (ā + б) / 2
○ C: (ā + б) / 4
○ D: (ā - б) / 4

7. **If magnitude of vector ā = 25 the ā.ā = ?**

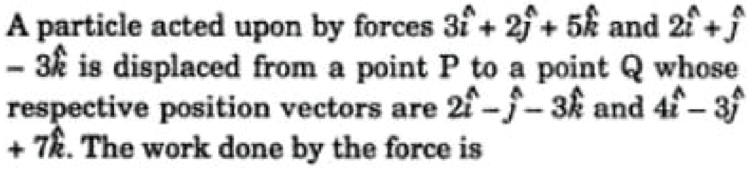
○ A: 5
○ B: 25
○ C: 625
○ D: 0

8. **Which of the following is not a defined quantity?**

○ A: i.i / k.k
○ B: i.j / j.j
○ C: i.i / i.k
○ D: All of them are defined quantities.

9. **If ā.i = 0 and ā.j = 0 and ā.k = 0 then value of ā is?**

○ A: i + j + k
○ B: [-1,-1,-1]
○ C: Unit vector.
○ D: Null vector.

10. 

A particle acted upon by forces $3\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}$ is displaced from a point P to a point Q whose respective position vectors are $2\hat{i} - \hat{j} - 3\hat{k}$ and $4\hat{i} - 3\hat{j} + 7\hat{k}$. The work done by the force is

○ A: 16
○ B: 24
○ C: 36
○ D: 38

11. **Value of [k, i, j] is?**

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

12. **Area of a parallelogram which has vectors i and i + j as the adjecent sides is?**

○ A: ½
○ B: 1
○ C: 2
○ D: √2

13. **If ā x б = i + 2j + 2k then б x ā= ?**

○ A: 1/3i + 2/3j + 2/3k
○ B: -i - 2j - 2k
○ C: 2i + 2j + k
○ D: None of the above.

14. **If ā = б then the value of triple scalar product ā.(б x c) is?**

○ A: 0
○ B: 1
○ C: -1
○ D: ā.б

15. Which of the following quantities is undefined?

○ A: (i.i) / (i x j) ○ B: (i.j) / (j.j)

○ C: (j x k) / (i x j) ○ D: (i x k) / (j x j)

16. Which of the following statement is true?

If a.b = 0 a and b are parallel, If a x b = 0 then either a or b must be zero,

If a. (b x c) = 0 then a, b and c are coplanar.

○ A: iii only ○ B: i and ii only

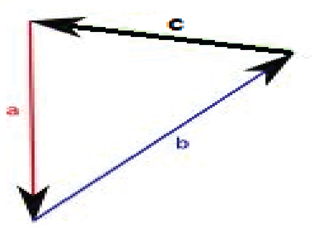
○ C: ii and iii only ○ D: i, ii and iii

17. If $u = 2\hat{i} - 4\hat{j} + 5\hat{k}$ and $v = 4\hat{i} - 3\hat{j} - 4\hat{k}$ then *u* and *v* are?

○ A: Parallel ○ B: Perpendicular

○ C: Equal ○ D: Opposite

18. Which of the following is true about the vector diagram given below?



○ A: c = a + b ○ B: c = a - b

○ C: a + b = 0 ○ D: a + b + c = 0

19. Which of the following position vectors have same magnitude?

a= [3,-4,2], b = [-3, 4, -2], c = [2, 4, 3]

○ A: a and b ○ B: a and c

○ C: All have same magnitude. ○ D: None of the has same magnitude.

20. In a parallelogram, the cross product of two adjacent vectors AB = i + 2j - 2j and BC = -2i + 2j + k is : 6i + 3j + 6k. The area of the parallelogram is?

○ A: 4.5 ○ B: 9

○ C: 15 ○ D: 18

I N D E X

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Test 2 11
Test 3 13
Test 4 15

Sets & Functions

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Matrices & Determination

Test 1 26
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Number Systems

TEST 1

1. **i^{13} = ?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

2. **If -1 + √-3 = r $e^{i\Theta}$ then Θ equals to?**

○ A: 2 pi / 3
○ B: -2 pi / 3
○ C: pi / 3
○ D: - pi / 3

3. **Square roots of -1 are?**

○ A: i , -I
○ B: i
○ C: 1
○ D: -i

4. $\left(\frac{2i}{1+i}\right)^2$ **is equal to?**

○ A: I
○ B: 2i
○ C: 1-I
○ D: 1-2i

5. **Conjugate of 4 + 5i is?**

○ A: -4 + 5i
○ B: 4 - 5i
○ C: $4^2 + (5i)^2$
○ D: 5 + 4i

6. **$(1 + i)^2$ = ?**

○ A: 2i
○ B: -2i
○ C: I
○ D: -i

7. **The value of** $\frac{i^{4n+1} - i^{4n-1}}{2}$ **is equal to?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

8. **If y and g are two complex numbers then** $\overline{y+g} = ?$

○ A: $\bar{Y}$. $\bar{g}$
○ B: $\bar{Y}$ / $\bar{g}$
○ C: $\bar{Y}$ + $\bar{g}$
○ D: $\bar{Y}$ - $\bar{g}$

9. **(3 + 2i) + (1 + i) = ?**

○ A: 4 + 2i
○ B: 4 + 3i
○ C: 4 - 2i
○ D: 4 - 3i

10. **The complex number i + √3 in polar form can be written as?**

○ A: $\frac{1}{\sqrt{2}}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ B: $2\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$
○ C: $\frac{1}{2}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ D: $4\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$

11. **If g = 2 + i√3 then g.ḡ = ?**

○ A: 2 - i√3
○ B: 13
○ C: 8
○ D: 7

12. **The moduli of complex number 1 - i√3 = ?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

13. **4 * (1 - 3i) = ?**

○ A: 4 - 3i
○ B: 40
○ C: 4 - 12i
○ D: None of the above.

14. **Multiplicative identity for complex numbers is?**

○ A: (0 , 0)
○ B: (0 , 1)
○ C: (1 ,1)
○ D: (1 , 0)

15. **If z is a complex number then | z1 . z2 | = ?**

○ A: $\sqrt{(z1)^2 + (z2)^2}$
○ B: $\sqrt{(z1)^2 - (z2)^2}$
○ C: | z1 | x | z2 |
○ D: | z1 | / | z2 |

16. **(5, 0) * (2 , 0) = ?**

○ A: 10
○ B: 10 + i
○ C: 10 + 2i
○ D: 10 + 5i

17. **If z = 1 + i then multiplicative inverse of z^2 is?**

○ A: 1 – I
○ B: i / 2
○ C: - i / 2
○ D: 2i

18. **What is the product of (1 + i) and (1 + 2i)?**

○ A: -2 + I
○ B: 2 + i
○ C: -1 + 3i
○ D: 1 + 3i

19. **The value of | -5i | is?**

○ A: 5
○ B: 10
○ C: 20
○ D: 25

20. $\left(\frac{1-i}{1+i}\right)^{20}$ **is equal to?**

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: -1

TEST 2

1. The complex number $(1 + 2i) / (1 - i)$ lies in?

○ A: I quadrant
○ B: II quadrant
○ C: III quadrant
○ D: IV quadrant.

2. A complex number added to its additive inverse would give?

○ A: Multiplicative identity
○ B: Additive identity
○ C: Additive inverse.
○ D: Multiplicative inverse.

3. If y is a complex number then $| -y | =$?

○ A: $| y |$
○ B: $| \bar{y} |$
○ C: $| -\bar{y} |$
○ D: All of the above.

4. If z is a complex number such that $z + 1/z = 1$ then the value of $z^{99} + 1/z^{99}$ is ?

○ A: 1
○ B: -1
○ C: 2
○ D: -2

5. Express in terms of *i* the sum of $\sqrt{-81}$ and $2\sqrt{-25}$.

○ A: 9i
○ B: -9i
○ C: 23i
○ D: 19i

6. Even integers (including zero) are closed under which of the following operation?

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: All of the above.

7. $\left[i^{67} + \frac{1}{i^{125}} \right] =$ **?**

○ A: 0
○ B: 2
○ C: 2i
○ D: -2i

8. If $F = x^3 + x^2 + 2x + 6$ then $F(i) =$?

○ A: 3 + I
○ B: 5 + i
○ C: 3 – I
○ D: 2 - 5i

9. Find multiplicative inverse of $\sqrt{2} - i\sqrt{5}$?

○ A: $-(\sqrt{2} / 7) + (\sqrt{5} / 7)I$
○ B: $(\sqrt{2} / 7) - (\sqrt{5} / 7)i$
○ C: $(\sqrt{2} / 7) + (\sqrt{5} / 7)I$
○ D: $-(\sqrt{2} / 7) - (\sqrt{5} / 7)i$

10. Square roots of number $(-3)^2$ are?

○ A: 3i , -3i
○ B: 3
○ C: -3i
○ D: 3, -3

11. If y is a complex number then $y \cdot \bar{y}$ = ?

○ A: $\bar{y}$

○ B: y

○ C: $|-y|^2$

○ D: None of the above.

The modulus of the complex number

12. $\dfrac{(1 - i\sqrt{3})(\cos\theta + i\sin\theta)}{2(1 - i)(\cos\theta - i\sin\theta)}$ **is**

○ A: 1/√2

○ B: 1/2√2

○ C: 1/√3

○ D: None of these.

13. $(\cos \Theta + i \sin \Theta)^n$ = ?

○ A: $(\cos \Theta^n + i \sin \Theta^n)$

○ B: cos nΘ - i sin nΘ

○ C: cos nΘ + i sin nΘ

○ D: ncos Θ + i n sin Θ

14. $i^5 + i^6$ = ?

○ A: 1 + I

○ B: -1 + i

○ C: i

○ D: 2I

15. $(-1)^{-21/2}$ = ?

○ A: 0

○ B: 1

○ C: I

○ D: -i

16. Multiplicative inverse of the complex number 1 + i is?

○ A: 1 – I

○ B: 1/2 + 1/2i

○ C: 1/2 - 1/2i

○ D: 1/√2 - i 1/√2

17. $\dfrac{2+i}{2-i} - \dfrac{2-i}{2+i} =$ **?**

○ A: i / 5

○ B: i / 3

○ C: 8i / 5

○ D: 7i / 5

18. The conjugate complex of number $(2 - i) / (1 - 2i)^2$ is equal to?

○ A: 2 / 25 + i 11 / 25

○ B: 2 / 25 - i 11 / 25

○ C: - 2 / 25 + i 11 / 25

○ D: - 2 / 25 - i 11 / 25

19. If $8iz^3 + 12z^2 - 18z + 27i = 0$, then?

○ A: |z| = 3/2

○ B: |z| = 2/3

○ C: |z| = 1

○ D: |z| = 1/3

20. (8 , 9) * (5, -6) =?

○ A: (14, -1)

○ B: (94, -3)

○ C: (48, -2)

○ D: None of the above.

TEST 3

1. **The triangle formed by points 1 , (1 + i) / √2 and i in the argand diagram is?**

○ A: Scalene

○ B: Equilateral

○ C: Isoceles

○ D: Right angled

2. **The smallest integer n for which** $\left(\frac{1+i}{1-i}\right)^n = 1$ **is?**

○ A: 4

○ B: 8

○ C: 12

○ D: 16

3. **$i^{88} - i^{22} = ?$**

○ A: I

○ B: -i

○ C: 1

○ D: 2

4. **If a = | z_1 | - | z_2 | ; b = | $z_1 + z_2$ | and c = | z_1 | + | z_2 | then which of the following is true?**

○ A: $c \le b \le a$

○ B: $a \le c \le b$

○ C: $b \le a \le c$

○ D: None of the above.

5. **if $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$, then b is equal to ?**

○ A: √3

○ B: √2

○ C: 1

○ D: None of the above.

6. **Number of solutions for the equation** $z^2 + \bar{z} = 0$ **is?**

○ A: One

○ B: Two

○ C: Three

○ D: Four

7. If *s* and *t* are different integers and $\sqrt{st} = 8$, which of the following could *not* be a value of *s* + *t*?

○ A: 16

○ B: 20

○ C: 34

○ D: 65

8. **The modulus of** $\sqrt{2i} - \sqrt{-2i}$ **is?**

○ A: 2

○ B: √2

○ C: 0

○ D: 2√2

9. If x = $\sqrt{-1-\sqrt{-1-\sqrt{-1-\sqrt{-1}}}}$ ... then x is equal to

○ A: w

○ B: w^2

○ C: w or w^2

○ D: 0

10. **The number of solutions for the equation $z^2 + |z|^2 = 0$ are? (z is a complex number)**

○ A: One

○ B: Two

○ C: Three

○ D: Infinite

11. The smallest positive number n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is?

○ A: 12
○ B: 8
○ C: 4
○ D: 2

12. For positive integers $(1-i)^n\left(1-\frac{1}{i}\right)^n$ **equals to?**

○ A: 0
○ B: $2i^n$
○ C: 2^n
○ D: 4^n

13. The complex numbers sin x + i cos 2x and cos x - i sin 2x are conjugate to each other for ?

○ A: x = n * pi
○ B: x = (n + 1/2) * pi
○ C: x = 0
○ D: No value of x.

14. Which of the following numbers lie on the imaginary axis of the Argand diagram?

○ A: 8 + 3i
○ B: 0 + 3i
○ C: 8 + 0i
○ D: None of the above.

15. Cube roots of unity?

○ A: Are collinear
○ B: Lie on the circle of radius $\sqrt{3}$
○ C: Form an equilateral triangle.
○ D: None of the above.

16. Which of the following is true about complex numbers?

○ A: They do not have a multiplicative inverse.
○ B: They don't have an additive inverse.
○ C: They always lie on the imaginary axis of the Argand diagram.
○ D: They don't satisfy the order of axioms.

17. Sum of three consecutive odd numbers is always divisible by?

○ A: 2
○ B: 3
○ C: 4
○ D: 6

18. $(a - ib)^3$ = ?

○ A: $a^3 - i(3a^2b - b^3)$
○ B: $a^3 - 3ab^2 - i(3a^3 - b^3)$
○ C: $a^3 + 3ab^2 - i(3a^2b - b^3)$
○ D: $a^3 - 3ab^2 - i(3a^2b - b^3)$

19. If $p^2 - 2pq + q^2 = c$ where p and q are positive integers and p is even and q is odd which of the following is true?

○ A: c is even and a perfect square.
○ B: c is odd and a perfect square.
○ C: c is even and not a perfect square.
○ D: c is odd and not a perfect square.

20. If $\left[\dfrac{(\sqrt{3}/2)+i\,(1/2)}{(\sqrt{3}/2)-i\,(1/2)}\right]^{120} = a + i\,b$, then

○ A: a = cos 20° and b = - sin 20°
○ B: a = cos 20° and b = sin 20°
○ C: a = 0 and b = 1
○ D: a = 1 and b = 0

TEST 4

1. $\left|(1+i)\left(\dfrac{2+i}{3+i}\right)\right|$ **is equal to?**

○ A: -1/2 ○ B: 1/2

○ C: 1 ○ D: -1

2. The value of $(-i)^{1/3}$ is ?

○ A: -I ○ B: i

○ C: 1 ○ D: None of the above.

3. Which of the following is an irrational number?

○ A: $\sqrt[3]{-8}$ ○ B: $\sqrt{\dfrac{32}{50}}$

○ C: $5 / \sqrt{5}$ ○ D: All of the above.

4. If $(x + iy)(p + iq) = (x^2 + y^2)i$ then?

○ A: p = x, q = y ○ B: $p = x^2$, $q = y^2$

○ C: q = x, p = y ○ D: None of the above.

5. If $\odot$ is an operation on positive real numbers, for which of the following definitions of $\odot$ is $r \odot s = s \odot r$ (commutative property)?

○ A: r Θ s = r – s ○ B: r Θ s = r / s

○ C: r Θ s = r^2s ○ D: r Θ s = (r + s) / (rs)

6. The complex number $1 + i\sqrt{3}$ in polar form is equal to?

○ A: $2 \cos 60^\circ - i\, 2 \sin 60^\circ$ ○ B: $4 \cos 60^\circ + i\, 4 \sin 60^\circ$

○ C: $4 \cos 60^\circ - i\, 4 \sin 60^\circ$ ○ D: $2 \cos 60^\circ + i\, 2 \sin 60^\circ$

7. (2 , 6) / (3 , 7) = ?

○ A: (6/29 , -1/29) ○ B: (2/29 , -2/29)

○ C: (24/29 , 2/29) ○ D: (18/29 , 2/29)

8. $\dfrac{(1+i)^n}{(1-i)^{n-2}}$ **is equal to?**

○ A: $4i^{n-2}$ ○ B: $2i^{n-4}$

○ C: $2i^{n-1}$ ○ D: None of the above.

9. **If $z = \dfrac{\sqrt{3}+i}{2}$, then $(z^{101} + i^{103})^{105}$ is equal to**

○ A: I ○ B: -1

○ C: 0 ○ D: 1

10. Reciprocal of i is?

○ A: -1

○ B: 1

○ C: I

○ D: -i

11. $\frac{(1+i)^{2n+1}}{(1-i)^{2n-1}}$ **is equal to?**

○ A: $2\,(-1)^n$

○ B: 2i

○ C: -2

○ D: 2 + 2i

12. If Ȳ = y then y is?

○ A: Complex number

○ B: Real number

○ C: Ȳ is complex conjugate of y

○ D: None of the above.

13. The equation $|z-1|^2 + |z+1|^2 = 2$ **represents?**

○ A: A circle of radius 1

○ B: A circle of radius 2

○ C: Ordered pair (0, 0)

○ D: A straight line.

14. The number 4 + 3i lies on the ?

○ A: Imaginary axis of the Argand diagram.

○ B: Real axis of the Argand diagram.

○ C: Neither real nor imaginary axis of the Argand diagram.

○ D: None of the above.

15. Absolute value of complex number z = a + ib = ?

○ A: a + b

○ B: $a^2 + b^2$

○ C: $\sqrt{z.\tilde{z}}$

○ D: $z.\tilde{z}$

16. If $z = \left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^5$, then

○ A: Re (z) > 0

○ B: Re (z) > 0 and Im (z) > 0

○ C: Re (z) > 0 and Im (z) < 0

○ D: Im (z) = 0

17. $\sqrt{\frac{1}{-4}}$ **is equal to?**

○ A: i / 2

○ B: - i / 2

○ C: 2 I

○ D: -2 i

18. If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$ **then** α^{31} **is equal to?**

○ A: α

○ B: α^2

○ C: 0

○ D: 1

19. (a + bi) * (c + di) = ?

○ A: (ac - bd) + (ad + bc) I

○ B: (ac + bd) + (ad + bc) i

○ C: (ac - bd) + (ad - bc) I

○ D: (ac + bd) + (ad - bc) i

Sets & Functions

TEST 1

1. **If $A \cap B = \Phi$ then A and B are called?**

○ A: Complement of each other.
○ B: Null sets
○ C: Disjoint sets
○ D: Universal sets.

2. **Residue class modulo 5 for 4 + 3 is?**

○ A: 2
○ B: 3
○ C: 5
○ D: 7

3. **$(A \cup B)' = ?$**

○ A: $A' \cup B'$
○ B: $A' \cap B'$
○ C: $A - B$
○ D: $(A - B)'$

4. **If $A = \{1,2,3\}$ and $B = \{2,3\}$, then $A \cup B = ?$**

○ A: $\{1\}$
○ B: $\{2,3\}$
○ C: $\{1,2\}$
○ D: $\{1,2,3\}$

5. **A set of all possible sub sets of a set is known as?**

○ A: Power set
○ B: Proper subset
○ C: Singleton Set
○ D: Universal set.

6. **$A \cap B = \Phi$ then $(A \cup B) = ?$**

○ A: $(A \cup B) = A + B$
○ B: $(A \cup B) = A + B - (A \cap B)$
○ C: $(A \cup B) = (A \cap B)$
○ D: Undefined.

7. **Set of all integers is not closed with respect to?**

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: Division

8. **Which of the following is a singleton set?**

○ A: $\{\ \}$
○ B: $\{0\}$
○ C: $\{5\}$
○ D: Both B and C.

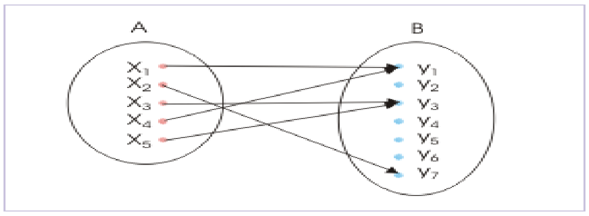
9. **Drawing conclusion from limited number of observations is called?**

○ A: Induction
○ B: Deduction
○ C: Logic
○ D: Proposition

10. **Z = {x | x = p/q where p,q Є Z and q ≠ 0} is a set of?**

○ A: Natural numbers
○ B: All integers
○ C: Irrational numbers
○ D: Rational numbers.

11. The figure below shows what kind of function?



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function

12. Which of the following relations is true?

○ A: 0 ∈ { }
○ B: 0 ∈ {Φ}
○ C: 0 ∈ {0}
○ D: None of the above.

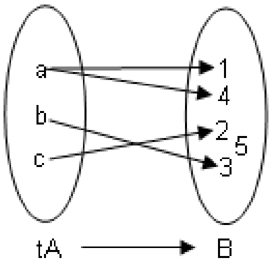
13. Which of the following is defined with respect to the universal set?

○ A: Difference of two sets.
○ B: Intersetction of sets
○ C: Union of sets
○ D: Complement of sets

14. Aristotelian logic has how many possible outcomes?

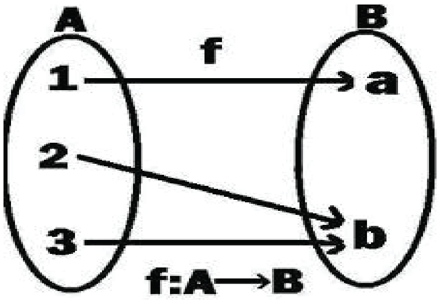
○ A: 1
○ B: 2
○ C: 3
○ D: 4

15. The diagram below shows that?



○ A: f is function from A to B
○ B: f is a one-one function from A to B
○ C: f is an onto function from A to B
○ D: f is not a function

16. The figure below shows what kind of function?



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

17. The domain of the function f = {(1, 3), (3, 5), (2, 6)} is?

○ A: 1, 3 and 2 ○ B: {1,3,2}

○ C: 3, 5 and 6 ○ D: {3,5,6}

18. Residue class modulo 7 for 9 + 5 is?

○ A: 14 ○ B: 7

○ C: 3 ○ D: 0

19. There are how many ways of describing a set?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

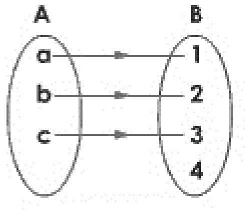
20. If A is a subset of B then A U B =?

○ A: A ○ B: B

○ C: A – B ○ D: B - A

TEST 2

1. The figure below shows what kind of function?



○ A: Into Function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

2. If $(x + 3, y - 2) = (7,5)$ then $(7x, 9y) = ?$

○ A: (3,-2)
○ B: (28,63)
○ C: (35,42)
○ D: (49,54)

3. If $f = \{(1, 4), (2, 5), (3, 6)\}$ and $g = \{(4, 8), (5, 7), (6, 9)\}$, then (gof) is?

○ A: $\{\ \}$
○ B: $\{(1, 8), (2, 7), (3, 9)\}$
○ C: $\{(1, 7), (2, 8), (3, 9)\}$
○ D: None of the above.

4. Logical form of $(A \cup B)' = A' \cap B'$ is?

○ A: $\sim(p \vee q) = \sim p \wedge \sim q$
○ B: $\sim(p \wedge q) = \sim p \vee \sim q$
○ C: $(p \vee q) = p \wedge q$
○ D: $(p \vee q) \rightarrow \sim p \wedge \sim q$

5. If A and B are overlapping sets then $A - B =$?

○ A: A
○ B: B
○ C: $A - (A \cap B)$
○ D: $B - (A \cap B)$

6. To be classified as a group, the set must satisfy how many properties?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

7. Set of rational + irrational numbers is a set of?

○ A: All integers
○ B: All real numbers
○ C: Whole numbers
○ D: All of the above.

8. Let $A = \{1, 2, 3\}$. Then, the domain of the relation $R = \{(1, 1), (2, 3), (2, 1)\}$ defined on A is?

○ A: $\{1,2\}$
○ B: $\{1,3\}$
○ C: $\{1,2,3\}$
○ D: None of the above.

9. All students who appear in GIKI entry test are pass, fail or put in the waiting list. If I appear in the GIKI entry test, I may pass, fail or be in the waiting list. This is an example of (choose the most appropriate answer)?

○ A: Induction
○ B: Deduction
○ C: Aristotelian logic
○ D: Non Aristotelian logic

10. $A - B = \Phi$ and A is not an empty then?

○ A: $B = \Phi$

○ B: $B - A = \Phi$

○ C: A is subset of B

○ D: B is subset of A.

11. If a set has 5 elements. Then number of elements in the power set would be?

○ A: 4

○ B: 8

○ C: 16

○ D: 32

12. Let A and B have 3 and 6 elements, respectively. What can be the minimum number of elements in A U B?

○ A: 3

○ B: 6

○ C: 9

○ D: Cannot determine.

13. If $f : A \rightarrow B$ be defined by $f(x) = x + i$, where i is a fixed integer and x set of integers, then f is?

○ A: Onto function

○ B: Into function

○ C: (1-1) and into function.

○ D: (1-1) and onto function.

14. If a set is closed with respect to an operation and the operation is associative then the set is called?

○ A: Semi group

○ B: Group

○ C: Monoid

○ D: Both A and C.

15. If A = {1, 2, 3} and B = {3, 4} and C = {4, 5, 6} then $(A \times B) \cap (B \times C)$ =?

○ A: {(1,4)}

○ B: {(3,4)}

○ C: {(1,4) , (3,4)}

○ D: {(2,4) , (1,3)}

16. The function f = {(1,2) , (1,3) , (1,4)} is a ?

○ A: Into function

○ B: Onto function

○ C: (1-1) onto function

○ D: None of the above.

17. Converse of $q \rightarrow p$ is?

○ A: $p \rightarrow q$

○ B: $\sim p \rightarrow \sim q$

○ C: $\sim q \rightarrow \sim p$

○ D: $\sim p \rightarrow q$

18. Set of all integers such that $|x-3| < 2$ is?

○ A: {1,2,3,4}

○ B: {1,2,3,4,5}

○ C: {2,3,4}

○ D: None of the above.

19. If A={1,2,3} , B = {1,2,3} and C = {3,2,1} which of the following is true?

○ A: A = B

○ B: C is inverse of A

○ C: A = B = C

○ D: Both A and B.

20. If A is a subset of B then A - B = ?

○ A: A

○ B: B

○ C: A - (A U B)

○ D: Φ

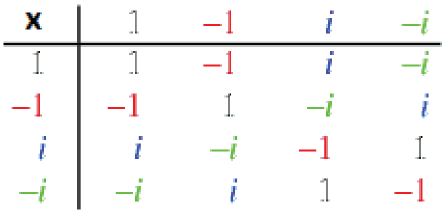
TEST 3

1. **In a town, 48% people are educated, 51% people are young, 60% are servicemen, 24% are educated and young, 25% are young and servicemen, 27% are educated and servicemen and 5% have all three characteristics. How many people (in percentage terms)do not have any of these three characteristics?**

○ A: 12%　　○ B: 9%

○ C: 5%　　○ D: 0%

2. **The table below shows multiplication operation on a set S = {1,-1,i,-i}. Which of the following is most accurate about the set w.r.t multiplication?**



x	1	-1	i	$-i$
1	1	-1	i	$-i$
-1	-1	1	$-i$	i
i	i	$-i$	-1	1
$-i$	$-i$	i	1	-1

○ A: It is a monoid　　○ B: It is a group

○ C: It is an abelian group　　○ D: It is a semi group

3. **In a zoo, there are 42 animals in the first sector, 34 in the second sector and 20 in the third sector. Out of these, 24 graze in sector one and also in sector two, 10 graze in sector two and sector three and 12 graze in sector one and sector three. These figures also include four animals grazing in all the three sectors. Find the total number of animals?**

○ A: 46　　○ B: 50

○ C: 54　　○ D: 60

4. **Let R be a relation in N defined by R = {(1+x , x^2) : x < 5 and x Є N}. Which of the following is false?**

○ A: Domain of R = {2,3,4,5}　　○ B: Range of R = {4,9,16,25}

○ C: R = {(1,2) , (2,4) , (3,9) , (4,16) , (5,25)}　　○ D: R = {(2,4) , (3,9) , (4,16) , (5,25)}

5. **For b Є N, bN = {bx : x Є N} then the first value of the set 6N ∩ 8N is?**

○ A: 8　　○ B: 16

○ C: 24　　○ D: 48

6. **Which of the following is a Singleton set?**

○ A: { x : |x|=5 , x Є N}　　○ B: { x : |x|=15 , x Є Z}

○ C: { x : x^2 , x Є Z}　　○ D: { x : 1 + x , x Є N}

7. **The set {x : x ≠ x} is?**

○ A: {0}　　○ B: {Φ}

○ C: {1}　　○ D: { }

8. **If N_a = {an : n Є N}, find the value of $N_6 \cap N_8$?**

○ A: N_6　　○ B: N_8

○ C: N_{12}　　○ D: N_{24}

9. **If n(A) = 115 , n(B) = 326 and n(A ∩ B) = 65. Then n(A U B) = ?**

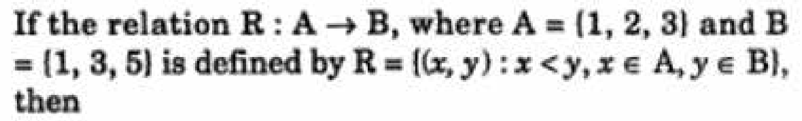
○ A: 68　　○ B: 73

○ C: 128　　○ D: 376

10. Which of the following cannot have a proper subset?

○ A: { x : x Є N}
○ B: { x : x Є Q, 3 < x < 4}
○ C: { x : x Є N, 3 < x < 4}
○ D: { x : x Є Z, 3 < x < 6}

11.



If the relation R : A → B, where A = {1, 2, 3} and B = {1, 3, 5} is defined by R = {(*x*, *y*) : *x* < *y*, *x* ∈ A, *y* ∈ B}, then

○ A: R = {(1,3) , (1,5) , (2,3) , (2,5) , (3,5)}
○ B: R = {(1,3) , (1,5) , (2,3) , (2,5) }
○ C: R^{-1} = {(3,1) , (5,1) , (3,2) , (5,2) , (3,3) }
○ D: R = {(1,1) , (1,3) , (1,5) , (2,3) , (2,5) }

12. Set of cube roots of unit w.r.t addition is?

○ A: Semi group
○ B: Group
○ C: Monoid
○ D: None of the above.

13. If X = {4^n – 3n – 1 : n Є N} and Y = {9 (n – 1) : n Є N}, find the value of X U Y?

○ A: X
○ B: Y
○ C: N
○ D: None of the above.

14. Let R by a relation in N defined by R = {(x,y) : x + 2y = 8}. The range of R is?

○ A: {2,4,6}
○ B: {1,2,3}
○ C: {2,4,6,8}
○ D: {1,2,3,4,5,6}

15. What are the missing entries in the conditional table below? (From top to bottom)

p	**q**	$p \rightarrow q$
T	T	?
T	F	?
F	T	?
F	F	?

○ A: T, F, F, T
○ B: T, T, T, F
○ C: T, F, T, F
○ D: T, F, T, T

16. The number of relations that can be defined on the set A = {a, b, c, d} is?

○ A: 16
○ B: 24
○ C: 4^4
○ D: 2^{16}

17. If n(A) = 115 , n(B) = 326 and n(A-B) = 47, then n(A ∩ B) = ?

○ A: 373
○ B: 158
○ C: 68
○ D: 44

18. Which of the following is an empty set?

○ A: { x : x Є R and $x^2 – 3 = 0$}
○ B: { x : x Є R and $x^2 + 3 = 0$}
○ C: { x : x Є R and x + 11 = 0}
○ D: { x : x Є R and $x^4 – 3 = 0$}

19. If for two sets A and B we have (A U B) = (A ∩ B) = B, then we have?

○ A: B = Φ and A ≠ Φ
○ B: A - B = Φ
○ C: B - A = Φ
○ D: A = B

20. The set of fourth roots of unity are closed with respect to?

○ A: Addition
○ B: Division
○ C: Subtraction
○ D: None of the above.

TEST 4

1. The inverse of function {(1,2) , (2,3) , (3,4)} is?

○ A: {(1,2) , (2,3) , (3,4)}
○ B: {(1,1/2) , (1/2,1/3) , (1/3,1/4)}
○ C: {(2,1) , (3,2) , (4,3)}
○ D: {(-1,-2) , (-2,-3) , (-3,-4)}

2. 46 in binary is?

○ A: 100110
○ B: 101111
○ C: 101110
○ D: 101010

3. In a town with a population of 5000, the number of people who are egg eaters is 3200. If 2500 are meat eaters and 1500 eat both egg and meat. How many of them eat neither meat nor egg?

○ A: 4200
○ B: 1500
○ C: 800
○ D: 500

4. If A = {1,2,3,4} then {(x,y) | $x+y < 5$} is a ?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function `
○ D: Not a function.

5. If A and B are disjoint sets then A - B = ?

○ A: A
○ B: B
○ C: B – A
○ D: Both A and C.

6. A group is called abelian group if?

○ A: It is closed
○ B: It satisfies associativity
○ C: It has inverse as part of the group.
○ D: It satisfied commutativity.

7. Let A = {a, b, c}. Then, the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is?

○ A: {a, b, c}
○ B: {a, b}
○ C: {a}
○ D: {b,c}

8. Contrapositive of $p \rightarrow q$ is?

○ A: $q \rightarrow p$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

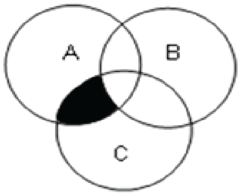
9. X = {0,1,2,3,4 .....} is a set of?

○ A: Natural numbers
○ B: Whole numbers
○ C: All integers
○ D: All of the above.

10. All Irish people drink beer. If someone is Irish he would definitely drink beer. The logic is an example of?

○ A: Proposition
○ B: Induction
○ C: Deduction
○ D: Logic analysis

The shaded area in this diagram represents



11.

○ A: $A \cap C$

○ B: $(A \cap B) - C$

○ C: $(A - C) \cap (A - B)$

○ D: $(A \cap C) - B$

12. Set of natural numbers is closed with respect to?

Addition, Multiplication, Subtraction

○ A: i only

○ B: ii only

○ C: i and ii only

○ D: i, ii and iii

13. If a function f: A→B is such that Ran f = B then f is a/an ?

○ A: Into function

○ B: Onto function

○ C: (1 – 1) and onto

○ D: Both B and C.

14. A, B and C are three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Which of the following conditions is true according to the given statement?

○ A: $A = B$

○ B: $B = C$

○ C: $A = C$

○ D: $A = B = C$

15. The set of cube roots of unit is closed with respect to?

○ A: Multiplication

○ B: Addition

○ C: Subtraction

○ D: None of the above.

16. If set $A = \{1, w, w^2\}$ is an abelian group then inverse of w is?

○ A: 1

○ B: w

○ C: w^2

○ D: Abelian group does not have an inverse.

17. The range of the function $f(x) = |x - 1|$ is? Where domain is the set of all integers.

○ A: $(-\infty, \infty)$

○ B: $(0, \infty)$

○ C: $[0, \infty)$

○ D: $(-\infty, 0)$

18. Which of the following is true about the null set?

It is the subset of every set. Number of elements in its power set is zero. It contains no elements

○ A: iii only

○ B: i and iii only

○ C: ii and iii only

○ D: i, ii and iii.

19. $Z = \{x \mid x \neq p/q$ where $p, q \in Z$ and $q \neq 0\}$ is a set of?

○ A: Natural numbers

○ B: All integers

○ C: Irrational numbers

○ D: Rational numbers.

20. If $A \cap B \neq \Phi$ then $(A \cup B) = ?$

○ A: $A + B$

○ B: $(A \cup B) = A + B - (A \cap B)$

○ C: $(A \cup B) = A + B + (A \cap B)$

○ D: Φ

Matrices & Determinations

TEST 1

1. **Inverse of the matrix $\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ is?**

○ A: $10\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$	○ B: $\frac{1}{10}\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$
○ C: $\frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$	○ D: $10\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

2. **The matrix below has order of?**

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

○ A: 6 x 1	○ B: 2 x 3
○ C: 3 x 2	○ D: 2 x 2

3. **If *A* and *B* are matrices, then which from the following is true ?**

○ A: $A + B \neq B + A$	○ B: $(A^t)^t \neq A$
○ C: $AB \neq BA$	○ D: All are true.

4. **A squar matrix is one in which?**

○ A: $n = m^2$	○ B: $n^2 = m$
○ C: n = m	○ D: All numbers are squares of integers.

5. **The number of non-zero rows in an echlon form is called ?**

○ A: reduced echlon form	○ B: rank of the matrix
○ C: conjugate of the matrix	○ D: co-factor of the matrix

6. **M_{12} the matrix given below is?**

$$\begin{vmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{vmatrix}$$

○ A: $\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix}$	○ B: $\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix}$
○ C: $\begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix}$	○ D: $\begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix}$

7. **The matrix given below is a?**

$$\begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 2 & 1 & 5 \end{bmatrix}$$

○ A: Symmetric.	○ B: Skew Symmetric
○ C: Hermitian	○ D: Skew Hermitian

8. What is the order of the matrix given below?

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

○ A: 6 x 1
○ B: 2 x 3
○ C: 3 x 2
○ D: 2 x 2

9. Determinant of singular matrix is ?

○ A: 1
○ B: positive
○ C: negative
○ D: 0

10. If the system of equations x – Ky – z = 0, Kx – y – z = 0, x + y – z = 0 has a non-zero solution, then the possible values of K are?

○ A: -1, 2
○ B: 1, 2
○ C: 0, 1
○ D: -1, 1

11. The following matrix is?

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{bmatrix}$$

○ A: Non singular
○ B: Unit matrix
○ C: Lower triangle.
○ D: Upper Triangle.

12. Value of $\begin{vmatrix} w & 1 & w \\ w & 2 & w \\ w & 3 & w \end{vmatrix}$ **is?**

○ A: w
○ B: 0
○ C: 1
○ D: 2

13. If A = $\begin{bmatrix} 2 & 5 \\ 5 & 2 \end{bmatrix}$**, then** $A^3 - 4A^2$ **is equal to**

○ A: $\begin{bmatrix} 42 & 105 \\ -105 & 42 \end{bmatrix}$
○ B: $\begin{bmatrix} 42 & 105 \\ 105 & 42 \end{bmatrix}$
○ C: $\begin{bmatrix} 105 & 42 \\ 105 & 42 \end{bmatrix}$
○ D: None of the above.

14. A determinant remains same if :

○ A: Every element in a column is multiplied by the same factor
○ B: Two columns are interchanged.
○ C: Two rows are interchanged.
○ D: Each element of any row is added to the corresponding element of any other row multiplied by given factor

15. For matrices $(AB)^t$ **= ?**

○ A: A^tB^t
○ B: AB
○ C: B^tA^t
○ D: BA

16. If A = $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A|$ is?

○ A: 2 ○ B: 3

○ C: 4 ○ D: 5

17. If AB = A then, B is a?

○ A: Unity Matrixq ○ B: Identity Matrix

○ C: Inverse of A ○ D: Both A & B.

18. If the order of matrix *A* is *m* x *p*. And the order of *B* is *p* x *n*. Then the order of *AB* is ?

○ A: m x p ○ B: p x n

○ C: m x n ○ D: n x m

19. For matrices A^{-1} = ?

○ A: $Adj\ A\ |A|$ ○ B: $|A|\ \frac{1}{Adj\,A}$

○ C: $\frac{1}{|A|\ A}Adj\ A$ ○ D: $\frac{1}{|A|}Adj\ A$

TEST 2

1. **Inverse for the matrix $a = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is?**

○ A: $\frac{1}{ad-bc}\begin{bmatrix} d & b \\ c & a \end{bmatrix}$ ○ B: $\frac{1}{ab-cd}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

○ C: $\frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ ○ D: $\frac{1}{ad-bc}\begin{bmatrix} -d & -b \\ -c & -a \end{bmatrix}$

2. **For matrices if AX = B then which of the following conditions holds?**

○ A: $X = A^{-1}B$ ○ B: $A^{-1}(AX) = BA^{-1}$

○ C: $X = BA^{-1}$ ○ D: All of the above.

3. **For matrices, if AX=B then X = ?**

○ A: B / |A| ○ B: $\frac{1}{|A|} * adj(A.B)$

○ C: $B.(\frac{1}{|A|}adjA)$ ○ D: $(\frac{1}{|A|} * adjA).B$

4. **Fine the cofactor A_{23} for the matrix $\begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix}$**

○ A: 7 ○ B: 0

○ C: 23 ○ D: -7

5. The matrix $B = \begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$ **can be defined as?**

○ A: Symmetric

`○ B: Skew Symmetric

○ C: Triangular

○ D: Hermitian

6. Find the cofactor A_{22} for the $\begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

○ A: 8

○ B: -7

○ C: -10

○ D: 3

7. If A is a square matrix, then A^{-1} does not exist if

○ A: $|A|>0$

○ B: $|A|<0$

○ C: $|A|=0$

○ D: $A\neq 0$

8. Value of determinance is?

○ A: 0

○ B: 1

○ C: x+y+z+w

○ D: xyzw

If

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

9. then order of matrix A = ?

○ A: 3 x 2

○ B: 2 x 3

○ C: 3 x 3

○ D: 2 x 2

10. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

○ A: 8

○ B: -8

○ C: 400

○ D: 0

11. If I is an identity matrix, then?

○ A: $I^n=0$

○ B: $I^n=I$

○ C: $2I=0$

○ D: None of these.

12. If x, y and z are non zero numbers. The inverse of matrix $\begin{bmatrix} x & y \\ z & 1 \end{bmatrix}$ **is?**

○ A: $\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$

○ B: $\dfrac{1}{x-yz}\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & -y \\ -z & -x \end{bmatrix}$

○ D: None of these.

13. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then?

○ A: $\alpha = a^2 + b^2, \beta = -2ab$

○ B: $\alpha = a^2 + b^2, \beta = ab$

○ C: $\alpha = a^2 - b^2, \beta = 2ab$

○ D: $\alpha = a^2 + b^2, \beta = 2ab$

14. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 23 \\ 0 & -10 \end{bmatrix}$ then |AB| is?

○ A: 80

○ B: 100

○ C: -110

○ D: 90

15. The number of non-zero rows when a matrix is reduced to echelon matrix form is known as?

○ A: Rank of the matrix.

○ B: Degree of matrix.

○ C: Skew echelon of matrix.

○ D: None of the above.

16. If augmented matrix of a system is of form $\begin{bmatrix} 1 & 0 & : & 5 \\ 0 & 1 & : & -3 \end{bmatrix}$ Solution to the equations of the system is?

○ A: 1 and 0

○ B: 0 and 1

○ C: 5 and -3

○ D: None of the above.

17. The value of the determinant given below is equal to

$$\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$$

○ A: 6 xyz

○ B: xyz

○ C: 4 xyz

○ D: xy + yz +zx

18. If a matrix A is multiplid with a number k then the determinant of resulting matrix is?

○ A: k |A|

○ B: 1/k |A|

○ C: k^2|A|

○ D: |A|

19. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

○ A: -3, 1

○ B: -1, 3

○ C: 3, 1

○ D: -3, -1

20. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ then A^2= ?

○ A: $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$

○ B: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

○ D: $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

TEST 3

1. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

○ A: [2, 4]
○ B: [0, 4]
○ C: [1, 4]
○ D: None of these.

2. If A and B are symmetric matrices, then AB + BA is a?

○ A: Symmetric matrix
○ B: Skew symmetric matrix
○ C: Diagonal matrix
○ D: Triangular matrix

3. Which of the following is an Echelon form of a matrix?

○ A: $\begin{bmatrix} 0 & 1 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$
○ C: $\begin{bmatrix} 0 & 2 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 8 \end{bmatrix}$
○ D: Both A & B.

4. 1, 2, 3, 4 are four numbers. If a matrix of order m x n is formed by using all the four numbers, then how many set of values (m, n) are possible?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

5. If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

○ A: $\begin{bmatrix} 13 & 4 \\ 8 & 5 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$
○ C: $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$
○ D: $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

6. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x, y not equal to zero, then D is

○ A: Divisible by neither x nor y.
○ B: Divisible by both x and y
○ C: Divisible by x but not y
○ D: Divisible by y but not x

7. $\begin{vmatrix} a+x & b & c \\ a & b+y & c \\ a & b & c+z \end{vmatrix}$ is equal to

○ A: $xyz\,(1 + a/x + b/y + c/z)$
○ B: $xyz\,(1 + x/a + y/b + z/c)$
○ C: $xyz\,(1 + x + y + z)$
○ D: $xyz\,(1 + a + b + c)$

Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$

8. If $|A|^2 = 25$, then $|\alpha|$ is equal to

○ A: 1/5q ○ B: 5

○ C: 1 ○ D: 25

9. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ such that $A + A^C = I$, then value of α is

○ A: $\pi/6$ ○ B: $\pi/3$

○ C: π ○ D: 0

10. Which is the following is the condition for a Skew Hermitian matrix?

○ A: $(\bar{A})^t = A$ ○ B: $(\bar{A})^t = A^2$

○ C: $(\bar{A})^t = -A$ ○ D: $\bar{A}^t = -A^2$

11. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$, where $a = i$, $b = \omega$, $c = \omega^2$, then Δ is equal to

○ A: I ○ B: -1

○ C: 1 ○ D: -i

12. If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$, then f(100) is equal to

○ A: 0 ○ B: 1

○ C: 100 ○ D: -100

13. The solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$ is

○ A: 1, 2, 3 ○ B: 1, 2, -3

○ C: -1, 2, 3 ○ D: -1, -2, 3

14. Which of the following is true for Echelon Form of a Matrix?

○ A: In any row, the number of zeros before the leading entry is greater than the number of such zeros in the preceding row.

○ B: All non zero rows preceeds row including zeros.

○ C: First entry in any non zero row is 1.

○ D: All of the above.

15. The matrix $A = \begin{bmatrix} 1 & 1-i \\ 1+i & 2 \end{bmatrix}$ is a?

○ A: Symmetric Matrix ○ B: Hermitian Matrix

○ C: Skew symmetric matrix ○ D: Skew hermitian matrix

16. The value of the determinate $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

○ A: 5√3 (-√6 – 5) ○ B: 5√3 (√6 – 5)

○ C: 5√3 (5 - √6) ○ D: √3 (√6 – 5)

17. If A and B are symmetric matrices, then AB would equal to?

○ A: -BA ○ B: BA

○ C: 0 ○ D: I

18. In reduced echelon form of the matrix if first non zero entry of a row lies in Column j, all other entries in the column are?

○ A: Positive ○ B: Negative

○ C: Zero ○ D: None of the above.

TEST 4

1. For the matrix below find the |A|?

$$A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

○ A: 30 ○ B: 40

○ C: 50 ○ D: 60

2. A triangular matrix is always a?

○ A: Echelon form of Matrix. ○ B: Reduced Echelon form of Matrix.

○ C: Square matrix. ○ D: Non of the above.

3. What is the conjugate of matrix $A = \begin{bmatrix} i & 10+i \\ -2i & 1-i \end{bmatrix}$

○ A: $\begin{bmatrix} -i & 10+i \\ -2i & 1+i \end{bmatrix}$ ○ B: $\begin{bmatrix} i & 10-i \\ 2i & 1-i \end{bmatrix}$

○ C: $\begin{bmatrix} -1 & 10-i \\ 2 & 1+i \end{bmatrix}$ ○ D: $\begin{bmatrix} -i & 10-i \\ 2i & 1+i \end{bmatrix}$

4. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

○ A: α=1 ○ B: α=0

○ C: α=-1 ○ D: None of these.

5. **The matrix A =** $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ **can be described as?**

○ A: Hermitian

○ B: Skew Hermitian

○ C: Symmetric

○ D: Skey Symmetric.

For a system of equations,

$x + 3y + 2z = 3$

$4x + 5y - 3z = -3$

$3x - 2y + 17z = 42$

6. **Fine the values of x, y and z if the echelon form of matrix is** $\begin{bmatrix} 1 & 3 & 2 & :3 \\ 0 & 1 & -1 & :-3 \\ 0 & 0 & 1 & :2 \end{bmatrix}$

○ A: x = 2 ; y = -1; z = 2

○ B: x = -2 ; y= 1; z= 2

○ C: x = 4 ; y = -1; z = 2

○ D: x= 2 ; y =-2; z = 2

7. **Find the value of a if the following matrix is singular** $\begin{bmatrix} -4 & 2 \\ -6 & a \end{bmatrix}$

○ A: -3

○ B: 3

○ C: 5

○ D: -5

8. **If A=**$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ **and A is symmetric then?**

○ A: x=0, y=5

○ B: x+y=5

○ C: x=y

○ D: None of the above.

9. **Let** $A = \begin{vmatrix} 1 & bc & a(b+c)) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b)) \end{vmatrix}$**. Value of A is equal to?**

○ A: ab + bc +ca

○ B: a + b + c

○ C: $(a + b + c)^2$

○ D: None of the above

10. **If in a square matrix A two rows or two columns are interchanged the determinant of the resulting matrix is?**

○ A: A^{-1}

○ B: -|A|

○ C: |A|

○ D: None of the above.

11. **What is the rank of the matrix** $A = \begin{bmatrix} 1 & 0 & 7 & -2 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

○ A: 1

○ B: 2

○ C: 3

○ D: 4

12. What is value of the determinant $A = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{vmatrix}$

○ A: 25 ○ B: -25

○ C: 30 ○ D: -30

13. If ω is the cube root of unity then the value of is ?

○ A: $a^3 + b^3 + c^3$ ○ B: ab - bc

○ C: 0 ○ D: $a^3 + b^3 + c^3$ -3abc

14. If x + ay = 0; y + az = 0; z + ax = 0, then the value of 'a' for which the system of equations will have infinite number of solutions is?

○ A: 1 ○ B: 0

○ C: -1 ○ D: None of these.

Quadratic Equations

TEST 1

1. **Find the value of x where $9x^2 - 12x - 5 = 0$.**

   ○ A: -1/3 , 5/3 ○ B: -2/3 , 5/3

   ○ C: -1/3, 2/3 ○ D: 2/3 , 5/3

2. **$\omega^{-12} = ?$**

   ○ A: ω ○ B: ω^2

   ○ C: 1 ○ D: 0

3. **If x-a is a factor of f(x) then f(a) = ?**

   ○ A: a ○ B: 0

   ○ C: 1 ○ D: w

4. **Solution to the equation $6x^2 + x - 15 = 0$ is?**

   ○ A: 3/2 , -3/2 ○ B: 6/7 , -4/5

   ○ C: 3/2 , -5/3 ○ D: None of the above.

5. **Roots of the equation $2x^2 + 5x - 1$ are?**

   ○ A: Complex ○ B: Irrational

   ○ C: Equal ○ D: Rational

6. **The condition for polynomial equation $ax^2 + bx + c = 0$ to be quadratic is?**

   ○ A: $a > 0$ ○ B: $a < 0$

   ○ C: $a \neq 0$ ○ D: $a \neq 0$ and $b \neq 0$

7. *If the product of the roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, the value of m is?*

   ○ A: 1 ○ B: -1

   ○ C: 1/3 ○ D: -1/3

8. **Quadratic equations are?**

   ○ A: First degree polynomials. ○ B: Second degree polynomials.

   ○ C: Third degree polynomials. ○ D: Fourth degree polynomials.

9. **$1 + \omega + \omega^2 = ?$**

   ○ A: 1 ○ B: ω

   ○ C: ω^2 ○ D: 0

10. **For quadratic equation $ax^2 + bx + c = 0$, Sum of roots is equal to?**

   ○ A: b/a ○ B: -b/a

   ○ C: c/a ○ D: -c/a

11. **If S and P are the sum and products of the roots of the quadratic equation, then the equation may be written as?**

   ○ A: $x^2 + Sx + P = 0$ ○ B: $x^2 - Sx - P = 0$

   ○ C: $x^2 - Sx + P = 0$ ○ D: $x^2 + Sx - P = 0$

12. Roots of the equation $x^2 + 7x + 12$ are?

○ A: 3, 4 ○ B: -3, 4

○ C: 3, -4 ○ D: -3, -4

13. Sum of all fourth roots of unit is?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

14. Product of all fourth roots of unity are?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

15. $\frac{-1+\sqrt{3}i}{2} * \frac{-1-\sqrt{3}i}{2}$ **= ?**

○ A: $\frac{-1+\sqrt{3}i}{2}$ ○ B: $\frac{-1-\sqrt{3}i}{2}$

○ C: 1 ○ D: 0

16. The solution for equation $x^2 - x = 2$ is?

○ A: 1 , -2 ○ B: -1, 4

○ C: 2, -1 ○ D: 2, -3

TEST 2

1. The degree of the equation $x^4 + 1/x^4 - 3 = 0$ is?

○ A: 4
○ B: 6
○ C: 8
○ D: None of the above.

2. $x + 2$ is a factor of ?

○ A: $x^4 + 2$
○ B: $x^4 - x^2 + 12$
○ C: $x^4 - 2x^3 - x + 2$
○ D: $x^4 + 2x^3 - x - 2$

3. If the equation $x^3 + 4x^2 - 2x + 5$ is divided by x-1 the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

4. $\omega^{-5} = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: None of the above.

5. The equation $\sqrt{x+3} + \sqrt{x+5} = \sqrt{3x+2}$ is called?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal equation
○ D: Square root equation.

6. The equation $2^{2x} + 4^x - 10 = 0$ is?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal
○ D: None of the above.

7. Out of the three cube roots of unit, how many are imaginary?

○ A: 1
○ B: 2
○ C: 3
○ D: Zero

8. If ω is the complex cube root of unity then $\omega = ?$

○ A: 0
○ B: 1
○ C: ω^2
○ D: ω^{-1}

9. If $x^2 + 1/x^2 = 27$, then the value of $x - 1/x$ is equal to ?

○ A: 5
○ B: 4
○ C: 3
○ D: 2

10. If the equation $x^3 + 4x^2 - 2x + 5 = 0$ is divided by x+1 the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

11. If one root of the equation $x^2 + px + q = 0$ is double the other, p^2/q is?

○ A: 1
○ B: 1/2
○ C: 2/9
○ D: 9/2

12. Roots of the equation $x^2 + 2x + 3 = 0$ are?

○ A: Unequal

○ B: Real

○ C: Complex

○ D: Both A & C.

13. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is?

○ A: 12

○ B: 4

○ C: 23/6

○ D: 49/4

14. $1/\omega$ = ?

○ A: ω

○ B: ω^2

○ C: 1

○ D: 0

15. If the roots of $ax^2 + b = 0$ are real and distinct, then?

○ A: $ab > 0$

○ B: $a = 0$

○ C: $a > 0$ and $b < 0$

○ D: $ab < 0$

16. If $b^2 - 4ac$ for a quadratic equation is a perfect square the roots are?

○ A: Rational

○ B: Irrational

○ C: Complex

○ D: None of these.

17. Cube roots of 8 are?

○ A: $-2, -2w$ and $-2w^2$

○ B: $2, 2w$ and $2w^2$

○ C: $2, w$ and w^2

○ D: $1, w$ and w^2

18. The roots of the equation $9x^2 - 12x + 4 = 0$ are?

○ A: Equal

○ B: Complex

○ C: Irrational

○ D: Unequal

19. If j and k are the roots of the equation $2x^2 - 4x + 5 = 0$ then $(j+1)(k+1)$ = ?

○ A: 11/2

○ B: -11/2

○ C: 2/11

○ D: -2/11

20. $x^4 - 2x^3 + 8x^2 - 2x + 1$ is called?

○ A: Radical equation

○ B: Exponential equation

○ C: Reciprocal equation

○ D: None of the above.

TEST 3

1. **$(1 + w - w^2)^8$ = ? where w is cube root of unity**.

○ A: $256w^2$ ○ B: $-256w^2$

○ C: 256w ○ D: -256w

2. **For what value of m the given equation would have equal root.**

$(m + 1)x^2 + 2(m+3)x + m + 8 = 0$

○ A: ½ ○ B: 1/3

○ C: -1/3 ○ D: 2/3

3. **The number of real solutions of $|x|^2 + 3|x| + 2 = 0$ is?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 0

4. **The roots of equation $x^2 + k = 0$, $k < 0$, are?**

○ A: Complex conjugates ○ B: Real and distinct

○ C: Real and same ○ D: Rational

5. **The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is**

○ A: 2 ○ B: -2

○ C: 0 ○ D: None of these.

6. **If the roots of the equation $ax^2 + bx + c = 0$ are such that their sum is equal to the sum of their squares, then?**

○ A: $2ac = ab + b^2$ ○ B: $2ac = a^2 + b^2$

○ C: $2ac = ab + b^3$ ○ D: None of the above.

If α, β be the roots of $x^2 - 2x + 4 = 0$, $(\alpha^5 + \beta^5)$ = ?

Hint: $(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$.

○ A: 243 ○ B: 81

○ C: 64 ○ D: 32

7. **If the equation $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a common non-zero root, the value of λ is?**

○ A: -1 ○ B: 1

○ C: 3 ○ D: -3

8. **The number of real roots of $(x + 1/x)^3 + (x + 1/x) = 0$ is**

○ A: 0 ○ B: 2

○ C: 4 ○ D: 6

9. **If $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, the value of (a + b) is?**

○ A: 1 ○ B: -1

○ C: 2 ○ D: 1/2

10. **If α and β are the roots of the equation $ax^2 + bx + c$, what is equation with roots 1/α and 1/β?**

○ A: $cy^2 + by - a = 0$ ○ B: $cy^2 - by - a = 0$

○ C: $y^2 + by + a = 0$ ○ D: $cy^2 + by + a = 0$

11. If $x = (3 + \sqrt{5})$, the value of $(2x^3 - 9x^2 - 10x + 13)$ is ?

○ A: 0
○ B: 1
○ C: $12\sqrt{5}$
○ D: None of the above.

12. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3$ is equal to

○ A: -1
○ B: 0
○ C: 1
○ D: 2

13. If one root of the equation $ax^2 + bx + c = 0$ is twice the other, then?

○ A: $2b^2 = 9ac$
○ B: $b^2 = 4ac$
○ C: $b^2 = 9ac$
○ D: $3b^2 = ac$

14. Only one of the root of the equation $ax^2 + bx + c = 0$, is zero, and $a \neq 0$ if,

○ A: $c = 0$
○ B: $c = 0$ and $b \neq 0$
○ C: $b = 0$ and $c = 0$
○ D: $b \neq 0$ and $c \neq 0$

15. If α and β are the roots of equation $ax^2 + bx + c = 0$ the value of $\alpha^2 + \beta^2$ is?

○ A: $\frac{b^2 + 2ca}{a^2}$
○ B: $\frac{b^2 - 2ca}{a}$
○ C: $\frac{b^2 - 2ca}{a^2}$
○ D: $\frac{b - 2ca}{a^2}$

16. If $a > 0$ and $x = \sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \ldots\ldots\ldots\ldots\infty}}}}$, the value of x is

○ A: $\frac{\sqrt{4a - 1}}{2}$
○ B: $\frac{1 \pm \sqrt{4a + 1}}{2}$
○ C: $\frac{-1 \pm \sqrt{4a + 1}}{2}$
○ D: $\frac{-2 \pm \sqrt{4a + 1}}{2}$

17. The roots of the equation $3^{2x+3} + 37 = 10\,(73.3^x + 1)$ are?

○ A: 2, -2
○ B: 3 , -3
○ C: 8 , 1/9
○ D: 3 , 1/3

18. Roots of the equation $x^2 + 5x - 1 = 0$ are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of the above.

19. If $\alpha + \beta = 4$ and $\alpha^3 + \beta^3 = 44$, α, β are the roots of ?

○ A: $2x^2 - 7x + 16 = 0$
○ B: $3x^2 + 9x + 11 = 0$
○ C: $9x^2 - 27x + 20 = 0$
○ D: None of the above.

TEST 4

1. The equation $x^5 + x^3 + 2x + 1 = 0$ has

○ A: No positive roots
○ B: Some positive roots
○ C: No negative roots
○ D: None of the above.

2. $(-1+\sqrt{-3})^4 + (-1-\sqrt{-3})^4 = ?$

○ A: 16ω
○ B: -16
○ C: 16
○ D: $16\omega^2$

3. For quadratic equations, If $b^2 - 4ac$ is a perfect square then the roots are?

○ A: Rational
○ B: Irrational
○ C: Equal
○ D: Complex

4. The number of real roots of the equation $x^6 - 7x^3 - 8 = 0$ is?

○ A: 1
○ B: 2
○ C: 3
○ D: 6

5. If $x^3 + kx^2 -7x + 6$ is divided by x + 2, the remainder is -8. The value of k is?

○ A: 5
○ B: -5
○ C: 1
○ D: -1

6. If the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 58$ is divided by (x - 2), then the quotient must be?

○ A: $x^3 + 5x^2 + 17$
○ B: $x^3 + 3x + 5$
○ C: $x^3 + 7x^2 + 17x + 29$
○ D: $x^3 + 17x + 29$

7. If $x^3 + x^2 + x + 1 = 0$ then possible values of x are?

○ A: 1, i, -I
○ B: -1, i^2, -i
○ C: -1, i, -I
○ D: None of the above.

8. If x +1/x = 1 then $x^3 + 1/x^3$ is equal to

○ A: 1
○ B: -1
○ C: 2
○ D: -2

9. If two of the four roots of 625 are 5 and 5i then the other two roots are?

○ A: -5, -5i
○ B: 5, 5i
○ C: -25, -25i
○ D: None of the above.

10. $(x + \omega y) . (x + \omega^2 y) = ?$

○ A: $x^2 - 2xy + y^2$
○ B: $x^2 + 2xy + y^2$
○ C: $x^2 + xy + y^2$
○ D: $x^2 - xy + y^2$

11. If 5 + i be one of the roots of a given equation f(x) = 0 with real coefficients, then the lowest degree of such an equation must be?

○ A: 2
○ B: 3
○ C: 6
○ D: Not enough information given to answer the question.

12. $\left(\frac{-1-\sqrt{3}i}{2}\right)^2$ **= ?**

○ A: $\left(\frac{-1+\sqrt{3}i}{2}\right)$ ○ B: 1

○ C: $\left(\frac{-1+i}{2}\right)$ ○ D: $\left(\frac{-1-i}{2}\right)$

13. If α, β are the roots of the equation $x^2 + x + 1 = 0$, the equation whose roots are α / β and β / α is?

○ A: $x^2 + x + 1 = 0$ ○ B: $x^2 - x + 1 = 0$

○ C: $x^2 + x - 1 = 0$ ○ D: $x^2 - x - 1 = 0$

14. $1 + \omega^4 = ?$

○ A: $1 + \omega$ ○ B: $-\omega^2$

○ C: 1 ○ D: Both A and B.

15. if $x + y = 7$ and $x^2 - xy + y^2 = 13$; What are the values of x and y?

○ A: (1,2) (-1,3) ○ B: (4,5) (-2,3)

○ C: (1,5) (2,5) ○ D: (4,3) (3,4)

16. An expression of the type $a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0 = 0$ is called

○ A: Polynomial of degree ○ B: Polynomial of degree 1

○ C: Polynomial of degree 2 ○ D: Polynomial of degree n

17. If the equations $x^2 + ax + b = 0$ and $x^2 + Ax + B = 0$ have a common root say ' t ', ' t ' must be equal to?

○ A: (B - b) / (a - A) ○ B: (a - A) / (b - B)

○ C: (a + A) / (B - b) ○ D: None of the above.

18. If $2 + i\sqrt{3}$ is a root of the equation $x^2 + px + q = 0$ (p & q being real), then p + q is equal to?

○ A: 3 ○ B: -3

○ C: √3 ○ D: - √3

19. The roots of the equation $12x^2 + mx + 5 = 0$ will be in the ratio 3 : 2, if m is equal to

○ A: 1/12 ○ B: 5/12

○ C: 5 √ 10 ○ D: 5/12 √ 10

Sequences & Series

TEST 1

1. **If a series has a common ratio between two terms. It is called?**

○ A: Geometric series. ○ B: Arithmetic series

○ C: Harmonic series ○ D: None of the above.

2. **Sum of infinite GP does not exist if?**

○ A: $|r| < 1$ ○ B: $|r| > 1$

○ C: $|r| = 1$ ○ D: Both B & C.

3. **Sum of infinite geometric series exists if?**

○ A: $|r| < 1$ ○ B: $|r| > 1$

○ C: $|r| = 1$ ○ D: $|r| = -1$

4. **If the sum of first n positive integers is 1/5 times the sum of their square. Then n equals?**

○ A: 5 ○ B: 6

○ C: 7 ○ D: 8

5. **Find next term for the series,**

1, -3, 5, -7, 9, ?

○ A: -9 ○ B: -11

○ C: -13 ○ D: -15

6. **If AP has $a=1$, $t_n = 20$ and $S_n = 399$, then the value of n is?**

○ A: 20 ○ B: 32

○ C: 38 ○ D: 40

7. **The 6th term of HP is 1/61 and tenth term is 1/105. The first term of HP is?**

○ A: 1/39 ○ B: 1/28

○ C: 1/17 ○ D: 1/6

8. **What are the number of terms in an AP if $a_1=3$, $d=7$ and $a_n=59$.**

○ A: 6 ○ B: 7

○ C: 8 ○ D: 9

9. **If first two terms of H.P are 1/2 and 1/4 then fourth term is?**

○ A: 1/6 ○ B: 1/8

○ C: 1/10 ○ D: 1/12

10. **Write the first four terms of the arithmetic sequence if $a_1 = 5$ and other three consecutive terms are** 23,26,29.?

○ A: 5, 10, 15, 20 ○ B: 5,8,11,14

○ C: 5, 9, 13, 17 ○ D: None of the above.

11. 3, 6, 12 is?

○ A: AP
○ B: GP
○ C: HP
○ D: None of the above.

12. 5th term of the GP 3, 6, 12 is?

○ A: 32
○ B: 36
○ C: 42
○ D: 48

13. If the first and the sixth terms of a G.P are 2 and 64, then its common ratio is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

14. If $x = 1 + y + y^2$ .... infinity. The value of y is?

○ A: $x / (x-1)$
○ B: $x / (1-x)$
○ C: $(x-1) / x$
○ D: $(1-x) / x$

15. Arithmetic mean is given by formula?

○ A: $(ab)^{1/2}$
○ B: $ab / (a + b)$
○ C: $(a + b) / 2$
○ D: None of the above.

16. Arithmetic mean between $1 - x + x^3$ and $1 + x + x^3$ is?

○ A: $1 + x^3$
○ B: $1 - x^3$
○ C: $1 + x$
○ D: $1 - x$

17. nth term of GP is given by formula?

○ A: $a_n=a_1r^n$
○ B: $a_n=a_1r^{n+1}$
○ C: $a_n=a_1r^{n-1}$
○ D: $a_n=a_1r^{n-2}$

18. The harmonic mean of $a / (1 - ab)$ and $a / (1 + ab)$ is?

○ A: $a / (1 - ab)$
○ B: $a / (1 - a^2b^2)$
○ C: a
○ D: $1 / (1 - a^2b^2)$

19. An infinite GP is oscillatory if?

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

20. What is the geometric mean between -2i and 8i?

○ A: ±4
○ B: ±4i
○ C: 3i
○ D: 8i

TEST 2

1. If the numbers a, b, c, d, e form an A.P then the value of a - 4b + 6c - 4d + e is?

○ A: 1 ○ B: 2

○ C: 0 ○ D: None of the above.

2. $$\sum_{k=1}^{n} k^2 = ?$$

○ A: n ○ B: n(n+1) / 2

○ C: n(n+1)(2n+1) / 6 ○ D: $[\ n(n+1)/2\ ]^2$

3. If 5 is HM between 2 and b then the value of b is?

○ A: 12.5 ○ B: 10

○ C: -10 ○ D: 8

4. What is the common ratio if $a_4 = 8/27$ and $a_7 = -64/729$?

○ A: ¼ ○ B: -1/3

○ C: -2/3 ○ D: -3/7

5. If x, y, z are in A.P, then (x + 2y - z) (2y + z - x) (z + x - y) = ?

○ A: xyz ○ B: 2xyz

○ C: 4xyz ○ D: 6xyz

6. If | x | < 1 and $y = x + x^2 + x^3 + \dots \infty$, then x is equal to?

○ A: 0 ○ B: xy

○ C: y / (1-y) ○ D: y / (1+y)

7. The sum of the series √3 + 1/√3 + 1/3√3 .... ∞ is equal to ?

○ A: √3 / 2 ○ B: 3√3 / 2

○ C: 3 ○ D: √3

8. If a, b, c are in A.P as well as in G.P then?

○ A: a = b ≠ c ○ B: a ≠ b = c

○ C: a ≠ b ≠ c ○ D: a = b = c

9. The nth terms of the two series: 3 + 10 + 17 + ------- and 63 + 65 + 67+......... are equal. Then the value of n is?

○ A: 9 ○ B: 13

○ C: 19 ○ D: 21

10. If the quadratic equation $(b^2 + c^2)x^2 - 2(a + b)cx + (c^2 + a^2) = 0$ has equal roots, then

○ A: a, b, c are in G.P ○ B: a, b, c are in A.P

○ C: a, c, b are in G.P ○ D: a, c, b are in A.P

The harmonic mean of the roots of the equation

11. $(5+\sqrt{2})x^2-(4+\sqrt{5})x+8+2\sqrt{5}=0$ **is**

○ A: 2
○ B: 4
○ C: 6
○ D: 8

12. If $a_n = (-3)\,(2/5)^n$ what the value of a_1 and r for the GP?

○ A: -6/5 and 2/5
○ B: 6/5 and 2/5
○ C: 3/8 and 1/5
○ D: -3/8 and 1/5

13. If in an AP $a_{25} - a_{20} = 45$, then d is equal to?

○ A: 9
○ B: -9
○ C: 18
○ D: 23

14. If $\frac{1}{x+y}$, $\frac{1}{2y}$, $\frac{1}{y+z}$ are in H.P, then x, y, z are in

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

15. For AP $T_{18} - T_8$ = ?

○ A: d
○ B: 2d
○ C: 10d
○ D: 26d

16. The value of the recurring fraction $0.0\overline{102}$ **is?**

○ A: 17 / 1665
○ B: 102 / 9999
○ C: 102 / 10000
○ D: 34 / 3339

17. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + 100^3)^{1/2} \div 100$ is?

○ A: √100
○ B: 100
○ C: 100.5
○ D: 50.5

18. If a, b, c, d, e, f are A.Ms (Arithmetic Means) between 2 and 12, then a + b + c + d + e + f is equal to?

○ A: 14
○ B: 42
○ C: 64
○ D: 82

19. The number of terms between 30 and 530, which are divisible by 11, is?

○ A: 30
○ B: 40
○ C: 46
○ D: 52

20. Find the sum of infinite GP 2, √2, 1 .....

○ A: $4 + \sqrt{2}$
○ B: $2 + 2\sqrt{2}$
○ C: $4 + 2\sqrt{2}$
○ D: $2+ 7\sqrt{2}$

TEST 3

1. **If $a^x = b^y = c^z = d^t$ and a, b, c, d are in G.P then x, y, z, and t are in?**

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of these.

2. If a^2, b^2, c^2 are in A.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in

○ A: G.P
○ B: H.P
○ C: A.P
○ D: None of the above.

3. **If mth term of H.P is n and nth term is m, then (m+n)th term is?**

○ A: mn / (m+n)
○ B: m / (m+n)
○ C: n / (m+n)
○ D: (m-n) / (m+n)

4. If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to

○ A: 0
○ B: 1
○ C: 2
○ D: 3

5. If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then a, b, c, d are in

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of these.

6. **If m^{th} term of an A.P is n and n^{th} term is m, then the $(m + n)^{th}$ term is ?**

○ A: 0
○ B: 1
○ C: -1
○ D: 2

7. If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, and $b \neq a + c$, then a, b, c are

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

8. If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} (ab)^n$, where $|a|, |b| < 1$, then

○ A: xyz = x + y + z
○ B: xy + z = xz + yz
○ C: xy + yz = xz + y
○ D: xy + xz = yz + x

9. **If $a^x = b^y = c^z$ and a, b, c are in G.P then x, y, z are in?**

○ A: A.P
○ B: H.P
○ C: G.P
○ D: None of the above.

10. If a, b, c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point and that point is

○ A: (-1. -2) ○ B: (-1, 2)

○ C: (1, -2) ○ D: (1, 2)

11. The harmonic mean of two numbers is 4. Their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 27$, the numbers are

○ A: 2, 15 ○ B: 9, 12

○ C: 6, 3 ○ D: 4, 8

12. Between 1 and 31 are inserted m arithmetic means, so that the ratio of the 7th and $(m-1)$th means is 5 : 9. Then the value of m is

○ A: 12 ○ B: 13

○ C: 14 ○ D: 15

13. If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to

○ A: 75 ○ B: 430

○ C: 864 ○ D: 900

14. If the sum of an infinite G.P is 3 and the sum of the squares of its terms is also 3, then its first term and common ratio are?

○ A: 3/2, ½ ○ B: 4/7, 1/3

○ C: 1, 1/2 ○ D: 1/8, 3/8

15. If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P., then

○ A: p, q, r are in A.P ○ B: q^2, p^2, r^2 are in A.P

○ C: p^2, q^2, r^2 are in A.P ○ D: p, r, q are in A.P

16. If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x \, dx$, then $I_1, I_2, I_3, \ldots\ldots$ are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

17. The sum of integers from 1 to 100 which are not divisible by 3 or 5 is?

○ A: 2438 ○ B: 4745

○ C: 2317 ○ D: 2632

18. The sum of all the odd numbers of four digits which are divisible by 9 is ?

○ A: 11007000 ○ B: 4362000

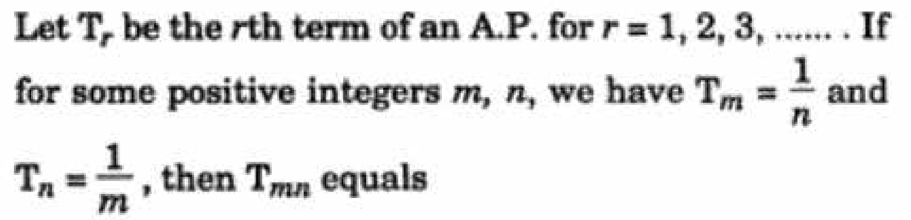
○ C: 6743000 ○ D: 2754000

19. The sum of 100 terms of the series $1^2 - 2^2 + 3^2 - 4^2 + \ldots\ldots$ is?

○ A: -5050 ○ B: -4720

○ C: -3870 ○ D: -2490

20.



Let T_r be the rth term of an A.P. for $r = 1, 2, 3, \ldots\ldots$. If for some positive integers m, n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then T_{mn} equals

○ A: 1 ○ B: 0

○ C: 1 / mn ○ D: 1/m + 1/n

TEST 4

1. 1 + 2 + 3 + 4 + ... n =?

○ A: n
○ B: n(n+1) / 2
○ C: n(n+1) / 6
○ D: n(n+1)(2n+1) / 6

2. If 5 and 8 are two AMs between a and b. What is the value of a and b?

○ A: 3, 14
○ B: 2, 11
○ C: 4, 13
○ D: 2, 16

3. If a, b, c, d, e, f are in arithmetic progression, then e - c = ?

○ A: 2(c - a)
○ B: 2(d - c)
○ C: 2(f - d)
○ D: d - c

4. If a_{n-2} term of an AP is 3n-11. What is the nth term of the sequence?

○ A: 2n – 8
○ B: 3n + 8
○ C: 3n – 5
○ D: 7n + 12

5. If |r| < 1 then the sum of n terms of GP are given by?

○ A: $S_n = a_1 (1 + r^n) / (1 - r)$
○ B: $S_n = a_1 (1 - r)^n / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (1 - r^n) / (1 + r)$

6. **The first term of an A.P of consecutive numbers is $p^2 + 1$. The sum of 2p + 1 terms of this series can be expressed as?**

○ A: $(p+1)^2$
○ B: $(p+1)^3$
○ C: $(2p +1) * (p+1)^2$
○ D: $p^3 + (p+1)^3$

7. The sum of first n terms of the series 1/2 + 3/4 + 7/8 + 15/16 + ... is equal to?

○ A: $2^n - n + 1$
○ B: $1 - 2^n$
○ C: $n + 2^{-n} – 1$
○ D: $2^n - 1$

8. The value of $0.4\overline{23}$ is

○ A: 419 / 999
○ B: 419 / 990
○ C: 423 / 1000
○ D: None of the above.

9. If |r| > 1 then the sum of n terms in a GP are given by formula?

○ A: $S_n = a_1 (r^n – 1) / (r + 1)$
○ B: $S_n = a_1 (r^n – 1) / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (r^n – 1) / (r - 1)$

10. Fine the 7th term of the series 2, 6, 11, 17, ...

○ A: 41
○ B: 47
○ C: 53
○ D: 62

11. Arithmetic mean between $3\sqrt{5}$ and $5\sqrt{5}$ is?

○ A: $4\sqrt{5}$
○ B: $8\sqrt{5}$
○ C: $5\sqrt{15}$
○ D: $15\sqrt{5}$

12. Harmonic mean between 3 and 7 is?

○ A: 7/3
○ B: 3/7
○ C: 21/5
○ D: 32/7

13. If k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an A.P, then k is equal to?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

14. If sum of the series $1 + \frac{3}{x} + \frac{9}{x^2} + \frac{27}{x^3} + \dots \infty$ is a finite number, then

○ A: $x < 3$
○ B: $x > 1/3$
○ C: $x < 1/3$
○ D: $x > 3$

15. If G.P consists of even number of terms and sum of all terms is equal to 5 times the sum of terms in odd places (meaning term 1, 3, 5, ...) then common ratio will be?

○ A: 3
○ B: 4
○ C: 5
○ D: 6

16. If a series has common difference between two consecutive numbers. It is called?

○ A: Geometric progression
○ B: Arithmetric progression
○ C: Harmonic progression
○ D: None of the above.

17. Which term of the AP 92, 88, 84, 80 ... is zero?

○ A: 22
○ B: 23
○ C: 24
○ D: 34

18. The angles of a triangle are in A.P. If the least angle is 30^0 the greatest angle is?

○ A: 45^0
○ B: 60^0
○ C: 75^0
○ D: 90^0

19. If a, b, c are in A.P, b - a, c - b and a are in G.P, then a : b : c is ?

○ A: 1:2:3
○ B: 1:4:9
○ C: 2:3:4
○ D: 1:2:4

20. If n arithmetic means are added between 2 and 38 and the sum of resulting series is 200. Then the value of n is?

○ A: 6
○ B: 8
○ C: 9
○ D: 10

Probability & Permutations

TEST 1

1. **If there are 3 roads from Lahore to Gujranwala and 4 roads from Gujranwala to Islamabad. How many different routes are there from Lahore to Islamabad?**

○ A: 4 ○ B: 10

○ C: 12 ○ D: 18

2. **If $^nC_8 = {^nC_{12}}$, What is value of n?**

○ A: 5 ○ B: 10

○ C: 20 ○ D: Cannot be determined.

3. **If the probability to score a century in any given match is 0.04. How many centuries the batsmen would make in 50 matches?**

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

4. **When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is?**

○ A: 1/216 ○ B: 8/27

○ C: 130/216 ○ D: 125/216

5. **A club has 20 members and you want to select the president and vice president for the club. How many different outcomes are possible if president and vice president cannot be the same person?**

○ A: 370 ○ B: 380

○ C: 390 ○ D: 398

6. **There are n points on a circle. The number of straight lines obtained by joining them is?**

○ A: $^nC_3$ ○ B: $^nC_2$

○ C: $^nC_2$ - n ○ D: ^nC_n

7. **Probability of occurance for one of the four equally likely events would be?**

○ A: 0 ○ B: 0.25

○ C: 0.75 ○ D: 1

8. **What is the probability of getting a sum 9 from two throws of a dice?**

○ A: 1/6 ○ B: 1/8

○ C: 1/9 ○ D: 1/12

9. **The number of ways of painting the faces of a cube with six different colours is?**

○ A: 1 ○ B: 6

○ C: 6! ○ D: None of the above.

10. **Which of the following is true?**

n! = n(n-1)!, 0! = 0, 4! = 4.3.2.1

○ A: iii only ○ B: i and ii only

○ C: i and iii only ○ D: i, ii and iii

11. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

○ A: 5/7 ○ B: 2/7
○ C: 3/5 ○ D: 2/5

12. A husband and a wife appear in an interview for the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that none of them will be selected?

○ A: 12/35 ○ B: 34/35
○ C: 24/35 ○ D: None of the above.

13. If you role a dice twice. What is the probability that you would get 6 both the times?

○ A: 1/3 ○ B: 1/6
○ C: 1/12 ○ D: 1/36

14. If A and B are two independent sets then P(A∩B) = ?

○ A: P(A) + P(B) ○ B: P(A) * P(B)
○ C: P(A) + P(B) – P(A∪B) ○ D: P(A)

15. The number of diagonals of a hexagon is?

○ A: 6 ○ B: 9
○ C: 15 ○ D: 18

16. The number of ways of selecting 2 candidates out of 5 equally qualified candidates for a post is?

○ A: 10 ○ B: 8
○ C: 5 ○ D: 20

17. P, Q, R and S are to give lectures to an audience. The organizer can arrange the order of their presentations in how many ways?

○ A: 4 ○ B: 8
○ C: 12 ○ D: 24

18. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: (p+q)! ○ B: (p+q)! / p!
○ C: (p+q)! / q! ○ D: (p+q)! / p!q!

19. A set with all possible outcomes of an experiment is called?

○ A: Probability function ○ B: Event space
○ C: Sample space ○ D: Both B and C.

20. 9! / (6!3!) = ?

○ A: 72 ○ B: 84
○ C: 96 ○ D: 108

TEST 2

1. The total number of different combinations of names which can be made from the letters of the word MISSISSIPPI, using all the letters at a time?

○ A: 4!x 4!x 2!
○ B: 11! / (4!x 4!x 2!)
○ C: 11! / (10!)
○ D: 11!

2. A work is given to 3 men and their probabilities for doing the work are 1/7, 1/4, 1/6 respectively. Find the probability that the work is done?

○ A: 39/84
○ B: 1/168
○ C: 167/168
○ D: 23/89

3. Three identical dice are rolled. The probability that the same number will appear on each of them is?

○ A: 1/6
○ B: 1/36
○ C: 1/216
○ D: 3/216

4. The number of subsets of a set containing n distinct objects is?

○ A: $^nC_1 + {}^nC_2 + {}^nC_3 + \ldots\ldots + {}^nC_n$
○ B: $^nC_0 + {}^nC_1 + {}^nC_2 + \ldots\ldots + {}^nC_n$
○ C: $2^n + 1$
○ D: None of the above.

5. The odds against drawing 2 red balls from a bag containing 3 red and 2 white balls is?

○ A: 1 : 2
○ B: 3 : 7
○ C: 7 : 3
○ D: 3 : 2

6. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that either Hafeez or Afridi would face the first ball?

○ A: 2/11
○ B: 1/11
○ C: 1/121
○ D: 1/110

7. There are 8 persons in the room. 4 are men and 4 are women. If two persons are selected, what is the probability that both of them would be men?

○ A: ½
○ B: 1/4
○ C: 3/7
○ D: 3/14

8. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is?

○ A: 21/46
○ B: 25/117
○ C: 1/50
○ D: 3/23

9. Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that neither Hafeez nor Afridi would face the first ball?

○ A: 2/11
○ B: 1/11
○ C: 9/11
○ D: 10/11

10. An rack has 5 black and 4 white ties. A boy pulls out 2 ties at random. The probability that 2 are of the same colour is?

○ A: 4/9
○ B: 5/9
○ C: 5/8
○ D: 3/8

11. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

○ A: 1/14 ○ B: 1/8
○ C: ¾ ○ D: 4/7

12. For any two events A and B, P(A ∩ B) is?

○ A: Less than P(A) + P(B) – 1 ○ B: Greater than P(A) + P(B)
○ C: P(A) + P(B) - P(A ∪ B) ○ D: P(A) + P(B) + P(A ∪ B)

13. The probability that a man will live 10 more years is 1/4 and the probability that his wife will live 10 more years is 1/3. The probability that neither of them will be alive in 10 years is?

○ A: 1/12 ○ B: 11/12
○ C: 7/12 ○ D: 1/2

14. A box contains 2 white, 3 black and 4 red balls. The number of ways in which 3 balls can be drawn from the box, so that at least one of the balls is black is?

○ A: 45 ○ B: 84
○ C: 64 ○ D: 32

15. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

○ A: 10/21 ○ B: 11/21
○ C: 2/7 ○ D: 5/7

16. The chances of wining of two race horses are 1/3 and 1/6 respectively. What is the probability that atleast one will win, when the horses are running in different races?

○ A: ½ ○ B: 1/8
○ C: 1/18 ○ D: 4/9

17. How many signal can be made with 4 signs using any number of signs at a time?

○ A: 24 ○ B: 60
○ C: 64 ○ D: 82

18. How many words can be formed by taking four different letters of the word MATHEMATICS?

○ A: 7920 ○ B: 1680
○ C: 1260 ○ D: 68

19. ^nP_r = ?

○ A: $^nC_r * r!$ ○ B: $^nC_{n-r} * r!$
○ C: $^nC_{n-r}$ ○ D: Both A and B.

20. If the probability that a batsmen scores a century in any given match is 0.3. On average how many matches the batsmen would play to score his first century?

○ A: 2 ○ B: 4
○ C: 15 ○ D: 30

TEST 3

1. A matrix is chosen at random from the set of all 2 x 2 matrices with elements 0 and 1 only. The probability that the value of the determinant of the matrix chosen is positive is?

○ A: 1/8 ○ B: 3/16

○ C: 1/16 ○ D: 13/16

2. Six identical coins are arranged in a row. The number of ways, in which the number of tails is equal to the number of heads is?

○ A: 20 ○ B: 24

○ C: 36 ○ D: 48

3. 3 books of english and 5 books of urdu are randomly placed on a shelve. What is the probability that books on the same subject are together?

○ A: 1/56 ○ B: 1/7

○ C: 2/8! ○ D: 1/28

4. When a dice is rolled probability that even number or number greater than 4 appear is?

○ A: 5/6 ○ B: 1/6

○ C: 2/3 ○ D: 1/3

5. There are 10 lamps of different colors in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is?

○ A: 1025 ○ B: 1024

○ C: 1023 ○ D: 10!

6. Eight chairs are numbered 1 to 8. 2 women and 3 men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is?

○ A: ${}^4C_3 \, . \, {}^4C_2$ ○ B: ${}^4C_2 \, . \, {}^4P_2$

○ C: ${}^4P_2 \, . \, {}^4P_3$ ○ D: ${}^4P_2 \, . \, {}^6P_3$

7. Find the number of ways in which a mixed double tennis game can be arranged between 10 players consisting of 6 men and 4 women?

○ A: 190 ○ B: 180

○ C: 90 ○ D: 48

8. There are 18 children in the room including 9 boys and 9 girls. You call a child to give a sweet and the child goes back to the room and can potentially be chosen again. If total number of sweets are 4, what is the probability that atleast one boy gets the sweet?

○ A: 1/16 ○ B: 15/16

○ C: 9/16 ○ D: 7/18

9. If five digit numbers are formed from 1,2,3,4,8. What is the probability of forming a number with 2 and 8 not next to each other?

○ A: 2/5 ○ B: 2/7

○ C: 5/7 ○ D: 3/5

10. In how many ways 8 books including 2 English books can be arranged together such that English books are not together?

○ A: 5040 ○ B: 10080

○ C: 30240 ○ D: 40320

A person wishes to make up as many different parties as he can out of his 20 friends, such that each party consists of the same number of persons. The number of friends he should invite at a time is?

○ A: 5 ○ B: 8

○ C: 10 ○ D: 12

11. Pakistan plays two matches each with West Indies and Australia. In any match, the probabilities of Pakistan getting points 0, 1 and 2 are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of Pakistan getting at least 7 points is?

○ A: 0.8750 ○ B: 0.0875

○ C: 0.0625 ○ D: 0.0250

12. In how many ways 5 boys and 4 girls can be seated in a bench such that boys and girls occupy alternate seats?

○ A: 1240 ○ B: 1560

○ C: 2590 ○ D: 2880

13. A man invites 4 men and 4 women to a party. In how many ways can they sit around a round table, so that no two men are together?

○ A: 6 ○ B: 24

○ C: 132 ○ D: 144

14. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:?

○ A: 3/22 ○ B: 1/22

○ C: 2/91 ○ D: 3/91

15. Two different numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is? Hint: $a^2 - b^2$ is divisible by 3 if both the numbers are divisible by 3 or none of them is divisible by 3.

○ A: 2/87 ○ B: 19/87

○ C: 37/87 ○ D: 47/87

16. $^{13}C_9 - {}^{12}C_8$ is equal to?

○ A: $^{13}C_7$ ○ B: $^{13}C_9$

○ C: $^{12}C_9$ ○ D: None of the above.

17. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 points lying on them respectively. The number of triangles that can be constructed using these points as vertices is?

○ A: 205 ○ B: 208

○ C: 220 ○ D: 260

18. If A and B are two events, such that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\overline{B}) = 1/2$, then the events A and B are?

○ A: Independent ○ B: Dependent

○ C: Disjoint ○ D: None of the above.

19. How many necklaces can be made from 6 beads of different colors?

○ A: 60 ○ B: 120

○ C: 360 ○ D: 720

TEST 4

1. A carton contains 20 bulbs, out of which 5 are defective. If a sample of 3 bulbs is selected at random, find the probability that 2 of them are defective bulbs?

○ A: 1/16 ○ B: 3/64

○ C: 9/64 ○ D: 2/64

2. The number of ways in which 12 balls can be divided between two friends, one receiving 8 and the other 4 is?

○ A: 12! / 8!4! ○ B: 12!2! / 8!4!

○ C: 12! / 8!4!2! ○ D: 8!4!

3. The probability that A can solve a problem is 2/3 and the probability that B can solve the problem is 3/4. The probability that at least one of A and B will be able to solve the problem is?

○ A: 11/12 ○ B: 5/12

○ C: 1/12 ○ D: 1/2

4. Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 1 heads after six tosses?

○ A: 0.08 ○ B: 0.17

○ C: 0.30 ○ D: 0.44

5. How many 5 digit number divisible by 2 can be formed from 1,2,3,5,7?

○ A: 24 ○ B: 48

○ C: 124 ○ D: 132

6. Out of 40 consecutive integers, two are chosen at random. The probability that their sum is odd is?

○ A: 1/200 ○ B: 1/2

○ C: 20/39 ○ D: 1/20

7. Cards are drawn one by one at random from a well shuffled pack of 52 cards. What is the probability that there is only one ace in first 17 cards?

○ A: $(^{4}C_{1} * \ ^{48}C_{16}) / \ ^{52}C_{17}$ ○ B: $^{48}C_{16} / \ ^{52}C_{17}$

○ C: $(^{4}C_{1} + \ ^{48}C_{16}) / \ ^{52}C_{17}$ ○ D: $^{4}C_{1} / \ ^{52}C_{17}$

8. H.C.F of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: None of the above.

9. The number of arrangements which can be made using all the letters of the word LAUGH, if the vowels are adjacent is?

○ A: 120 ○ B: 24

○ C: 48 ○ D: 56

10. On the occasion of Eid festival, each student of a class sends greeting cards to others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is?

○ A: $^{20}C_2$ ○ B: $2 \times \ ^{20}C_2$

○ C: $2 \ ^{20}P_2 - 1$ ○ D: None of the above.

11. There are 4 letter boxes in a post office. In how many ways can a man post 8 different letters?

○ A: 4^8 ○ B: 8^4

○ C: 8! ○ D: 4!

12. 5 men and 6 women have to be seated in a straight row, so that no two women are together. Find the number of ways in which this can be done?

○ A: 43200 ○ B: 39600

○ C: 36000 ○ D: 86400

13. The number of ways in which 5 beads of different colours can form a necklace is?

○ A: 6 ○ B: 12

○ C: 24 ○ D: 60

14. L.C.M. of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: n

15. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

○ A: ¾ ○ B: 1/3

○ C: 7/19 ○ D: 9/21

16. $^{n}P_{n}$ = ?

○ A: $^{n}C_{n}$ ○ B: $^{n+1}C_{n}$

○ C: n ○ D: n!

17. Everybody in a room shakes hand with every other person. The total number of hand shakes is 66. Find the total number of persons in the room?

○ A: 9 ○ B: 10

○ C: 11 ○ D: 12

18. A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 1/3, 1/4 respectively. What is the probability that the problem will be solved?

○ A: ¼ ○ B: 1/24

○ C: 7/24 ○ D: 3/4

19. The number of ways in which a mixed double game can be arranged from among nine married couples, if no husband and wife play in the same game is?

○ A: 1512 ○ B: 756

○ C: 3024 ○ D: 3298

20. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: C(p + q, q) ○ B: P(p + q, p)

○ C: P(p + q, q) ○ D: C(p + q, p - q)

21. If you toss four coins, what is the probability of getting two heads and two tails?

○ A: 3/16 ○ B: 1/8

○ C: 2/8 ○ D: 3/8

22. When three dice are thrown, what is the probability of getting the same number on three of them?

○ A: 1/216 ○ B: 1/36

○ C: 5/36 ○ D: 1/6

23. The number of digits that can be formed from 2, 3, 5, 7, 8 with 2 and 8 next to each other is?

○ A: 24
○ B: 36
○ C: 48
○ D: 72

24. An employer wants to hire 3 analysts from 6 applicants and 2 designers from 4 applicants. What is the total number of ways in which she can make the selection?

○ A: 1490
○ B: 132
○ C: 120
○ D: 60

25. If ${}^{n}C_{r-1} = 36$, ${}^{n}C_{r} = 84$ and ${}^{n}C_{r+1} = 126$, then r is equal to?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

26. Four cars are racing in a circuit. What are the total number of permutations with which they can cross the finish line?

○ A: 4
○ B: 16
○ C: 18
○ D: 24

27. The probability that the 1st day of a random chosen month is a Friday is?

○ A: 1/7
○ B: 1/12
○ C: 1/19
○ D: 1/84

28. m parallel lines in a plane are intersected by a family of n parallel lines. The total number of parallelograms so formed is?

○ A: (m-1)(n-1) / 4
○ B: mn/4
○ C: m(m-1)(n-1)/2
○ D: mn(m-1)(n-1)/4

29. There are 10 girls and 20 boys in a class. 5 girls and 10 boys have blue eyes. Find the probability that one student chosen at random is a girl and has blue eyes?

○ A: 2/3
○ B: 5/6
○ C: 1/6
○ D: 1/2

30. If $P(A \cup B) \neq P(A) + P(B)$ Then;

○ A: A and B are disjoint sets.
○ B: A and B are Independent sets
○ C: A and B are overlapping sets
○ D: A and B are unit event sets.

31. From a set of 17 cards numbered 1 to 17, one card is drawn at random. The probability that the number is divisible by 3 or 7 is?

○ A: 2/17
○ B: 5/17
○ C: 7/17
○ D: 9/17

32. The number of times the digit 3 will appear listing the integers from 1 to 1000 is?

○ A: 271
○ B: 280
○ C: 297
○ D: 300

33. Three unbiased coins are tossed. What is the probability of getting atleast one head?

○ A: ¾
○ B: 1/4
○ C: 1/8
○ D: 7/8

Induction & Binomial Theorem

TEST 1

1. **Which of the following is not true regarding the binomial expansion of $(a + x)^n$?**
   - ○ A: Total number of terms is n + 1.
   - ○ B: Sum of exponents of a and x in each term of expansion is equal to n.
   - ○ C: Exponent of a decrease from n to n - 1.
   - ○ D: Exponent of x increase from 0 to n.

2. **What is the coefficient of the third term for $(x + y)^5$?**
   - ○ A: 2
   - ○ B: 5
   - ○ C: 8
   - ○ D: 10

3. **What is the general term of $(x + 2/x)^4$?**
   - ○ A: $C(4,k)\ 2^k\ x^{4-2k}$
   - ○ B: $C(4,k)\ 2^k\ x^{2-2k}$
   - ○ C: $C(4,k)\ 2^k\ x^{4-k}$
   - ○ D: $C(4,k)\ 2^{2k}\ x^{2-2k}$

4. **$(x+y)^4 = ?$**
   - ○ A: $x^4 + 2x^3y + 4x^2y^2 + 2xy^3 + y^4$
   - ○ B: $x^4 + 4x^3y + 6x^2y^2 + 2xy^3 + y^4$
   - ○ C: $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$
   - ○ D: $x^4 + 4x^3y + 8x^2y^2 + 4xy^3 + y^4$

5. **If n is odd, the middle term in the expansion of $(a + x)^n$ is?**
   - ○ A: n/2 + 1
   - ○ B: n/2 and n/2 + 1
   - ○ C: (n + 1) / 2 and (n + 2) / 2
   - ○ D: (n + 1) / 2 and (n + 3) / 2

TEST 2

1. **The method of mathematical induction was devised by?**

○ A: David Hilbert
○ B: Francesco Mourolico
○ C: Issac Newton
○ D: Carl F. Gauss

2. **What is the 3rd term in the binomial expansion of**

3. $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^6$

○ A: -20
○ B: 20
○ C: 15 a/x
○ D: 15 x/a

4. **Third term in the expansion of $(1 - x)^{-1}$ is?**

○ A: x^2
○ B: $2x^2$
○ C: $-x^2$
○ D: $-2x^2$

5. **Which of the following would have even number of terms in its expansion?**

○ A: $(a + x)^{20}$
○ B: $(a + x)^{90}$
○ C: $(a + x)^{51}$
○ D: Both A and B.

6. **What is the value of $(0.97)^6$ using only the first three terms of binomial expansion?**

○ A: 0.8246
○ B: 0.8318
○ C: 0.8335
○ D: 0.8452

7. **How many terms are there in the expansion of $(a + x)^{100}$**

○ A: 99
○ B: 100
○ C: 101
○ D: Cannot determine.

8. **What is the middle term in the expansion of $(4x – y)^8$?**

○ A: 19240 x^4y^4
○ B: 17920 x^4y^4
○ C: 56220 x^2y^2
○ D: 18420 x^4y^4

9. **What is the contant term in the expansion of $(1/z^3 + z^2)^5$?**

○ A: 10
○ B: 16
○ C: 18
○ D: 24

10. **What is the fourth term in the expansion of $(1 - x)^{1/2}$?**

○ A: - ¼
○ B: - 1/2 x
○ C: -1/8 x^2
○ D: - 1/16 x^3

TEST 3

1. For which x the 5th expansion member equals $M_5 = 105$?

$$\left(\frac{1}{2\sqrt{x}} - \frac{1}{2}\right)^{10}$$

○ A: ½ ○ B: 1/4

○ C: 1/8 ○ D: 2

2. If x is the sum of the odd coefficients and y is the sum of the even coefficients in a binomial expansion. Then?

○ A: x = y/2 ○ B: x = y

○ C: x = 2y ○ D: None of the above.

3. The rule of binomial expansion for $(a + x)^n$ is valid if?

○ A: a and x both are real numbers. ○ B: a is real and x can be real or complex.

○ C: x is real and a can be real or complex. ○ D: Both a and x can be real or complex.

4. Find out the member of the binomial expansion of $(x + x^{-1})^8$ not containing x?

○ A: 7th ○ B: 6th

○ C: 5th ○ D: 4th

5. If in the expansion of $(x + y^3)^n$ the coefficient of the 3rd term is greater by 44 than the 2nd term. The value of n is?

○ A: 8 ○ B: 9

○ C: 10 ○ D: 11

6. Which term in the expansion of $(x - 2/x^2)^{13}$ has term x^{-2} ?

○ A: 5th ○ B: 6th

○ C: 7th ○ D: 8th

7. The sum of coefficients in the binomial expansion is equal to?

○ A: 2^n ○ B: 2^{2n}

○ C: 2^{2n-1} ○ D: 2^{n-1}

8. What is the middle term in the expansion of $(x + 1/x)^{2n}$? Where $x \neq 0$.

○ A: C(2n,n) ○ B: C(2n,n) x

○ C: C(2n,n) x^{2n} ○ D: C(2n,n) x^{3n}

9. What is the constant term in the expansion of $(x^2 - 2/x^2)^8$?

○ A: 1080 ○ B: 1120

○ C: 2400 ○ D: 2480

10. Which member of the binomial expansion of $(2x^3 + x^{-1})^{10}$contains x^6?

○ A: 6th ○ B: 7th

○ C: 8th ○ D: 9th

11. What is the term containing x^{14} in the expansion of $(x^3 - 1/x^2)^{13}$?

○ A: C(13,7) $12x^{14}$ ○ B: -C(13,6) $10x^{14}$

○ C: -C(13,5) x^{14} ○ D: C(13,8) $4x^{14}$

Trigonometry

TEST 1

1. 235° expressed in radians is?

○ A: π / 235
○ B: 85π / 49
○ C: 47π / 36
○ D: 235/π

2. 1/2 rotation anti-clockwise is called?

○ A: Right angle
○ B: Straight Angle
○ C: Circle
○ D: None of the above.

3. If $5\sin\theta = 3$, $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to

○ A: ½
○ B: 1
○ C: 2
○ D: 4

4. If $\cos 3\theta = \sqrt{3}/2$; $0 < \theta < 20^{o}$ then the value of θ is?

○ A: 0°
○ B: 5°
○ C: 10°
○ D: 15°

5. If sec θ - tan θ = 1/2 then sec θ + tan θ = ?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. cos A - cos B = ?

○ A: 2 cos (A+B)/2 cos (A-B)/2
○ B: 2 cos (A+B)/2 sin (A-B)/2
○ C: 2 sin (A+B)/2 cos (A-B)/2
○ D: -2 sin (A+B)/2 sin (A-B)/2

7. Which of the following is not ture?

○ A: cot (-θ) = - cot θ
○ B: cos (-θ) = cos θ
○ C: sin (-θ) = - sin θ
○ D: tan (-θ) = tan (θ)

8. sin 30^{0} + cos 60^{0} + tan 45^{0} is equal to?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

9. In sexagesimal system angle is represented in?

○ A: Degrees
○ B: Degrees, Minutes and Seconds
○ C: Radians
○ D: Mircro radians.

10. If sin θ = cos θ then θ = ?

○ A: 30°
○ B: 45°
○ C: 60°
○ D: 75°

11. If the length of arc is twice the radius of the circle. Then angle subtended at the center is?

○ A: 1 radian
○ B: 2 radian
○ C: π/3 radian
○ D: π/4 radian

12. What is the period of tan 4x?

○ A: π

○ B: π/3

○ C: π/4

○ D: π/8

13. $\tan^2 x - \sin^2 x$ is equal to?

○ A: $\tan^2 x\ \mathrm{cosec}^2 x$

○ B: $\sin^2 x \cot^2 x$

○ C: $\sec^2 x\ \mathrm{cosec}^2 x$

○ D: $\tan^2 x \sin^2 x$

14. $\tan 225^o$ =?

○ A: 0

○ B: 1

○ C: √3

○ D: 1/√3

15. tan (2π - θ) = ?

○ A: tan θ

○ B: - tan θ

○ C: cot θ

○ D: - cot θ

16. If cos A = 1/√2 and sin B = 1/2 then A+B = ?

○ A: 60°

○ B: 75°

○ C: 90°

○ D: 120°

17. 1° = ?

○ A: 0.0125 radian

○ B: 0.0175 radian

○ C: 0.0225 radian

○ D: 0.0275 radian

18. 35° 20' in radians is?

○ A: 28π / 220

○ B: 53π / 45

○ C: 53π / 290

○ D: 53π / 270

19. cos (π + θ) = ?

○ A: sin θ

○ B: - sin θ

○ C: cos θ

○ D: - cos θ

20. If A = B = 60°. Then $\dfrac{cscA + cotB}{secA * tanB}$ = ?

○ A: 0

○ B: 1

○ C: ½

○ D: 1/√2

TEST 2

1. Which of the following relations is possible?

○ A: sec θ = 2/3

○ B: sin θ = 4/3

○ C: tan θ = 2014

○ D: cos θ = $(1+t^2) / (1-t^2)$

2. sec (-960°) = ?

○ A: 2

○ B: √2

○ C: -√2

○ D: -2

3. cos 2α = ?

○ A: sin α cos α

○ B: 2 sin α cos α

○ C: $\cos^2 \alpha - \sin^2 \alpha$

○ D: $\cos^2 \alpha + \sin^2 \alpha$

4. If α, β and γ are the angles of a triangle then $\sin(\alpha + \beta) = ?$

○ A: $\sin \gamma$
○ B: $\cos \gamma$
○ C: $-\sin \gamma$
○ D: $-\cos \gamma$

5. $\sin(-625^{\circ}) = ?$

○ A: $\sin 5^{\circ}$
○ B: $\cos 5^{\circ}$
○ C: $\sin 15^{\circ}$
○ D: $\cos 15^{\circ}$

6. Converting 21.256° to DMS gives?

○ A: $21^{\circ}\ 15.36'$
○ B: $21^{\circ}\ 18'\ 32''$
○ C: $21^{\circ}\ 15'\ 22''$
○ D: $21^{\circ}\ 15'\ 28''$

7. If $\sin(A + B + C) = 1$, $\tan(A - B) = 1/\sqrt{3}$, and $\sec(A + C) = 2$, then?

○ A: $A = 120^{\circ}$, $B = 60^{\circ}$ and $C = 0^{\circ}$
○ B: $A = 60^{\circ}$, $B = 30^{\circ}$ and $C = 0^{\circ}$
○ C: $A = 60^{\circ}$, $B = 60^{\circ}$ and $C = 60^{\circ}$
○ D: $A = 90^{\circ}$, $B = 60^{\circ}$ and $C = 30^{\circ}$

8. $\sin A + \sin B = ?$

○ A: $-2 \sin (A+B)/2 \sin (A-B)/2$
○ B: $2 \cos (A+B)/2 \cos (A-B)/2$
○ C: $2 \sin (A+B)/2 \cos (A-B)/2$
○ D: $2 \cos (A+B)/2 \sin (A-B)/2$

9. The value of $\tan 15^{\circ} + \cot 15^{\circ}$ is ?

○ A: 1
○ B: $\sqrt{3}$
○ C: $\sqrt{3}/2$
○ D: 4

10. The period of the function $f(x) = \cos 4x$ is?

○ A: π
○ B: 2π
○ C: $\pi/2$
○ D: $3\pi/2$

11. If $x = \sin^2 \theta \cos \theta$ and $y = \cos^2 \theta \sin \theta$ then $\sin \theta = ?$

○ A: x^2 / y
○ B: y^2 / x
○ C: $(y^2 / x)^{1/3}$
○ D: $(x^2 / y)^{1/3}$

12. What is the period of $\cot x/7$?

○ A: 7π
○ B: $2\pi/7$
○ C: $\pi/7$
○ D: $\pi/14$

13. If $\cot \theta = \sin 2\theta$, then θ is equal to?

○ A: 45° and 90°
○ B: 45° and 90°
○ C: 90° and 60°
○ D: 60° and 30°

14. The value of $\cos^2 15° - \cos^2 30° + \cos^2 45° - \cos^2 60° + \cos^2 75°$ is?

○ A: 1
○ B: 1/2
○ C: 3/2
○ D: 2

15. If $\tan \theta = 8/15$ then what is the value of $\sec \theta$ for θ lying in the quadrant III?

○ A: 15/17
○ B: -15/17
○ C: 17/15
○ D: - 17/15

16. The largest value of $\sin\theta \times \cos\theta$ is?

○ A: 1
○ B: 1/2
○ C: $1/\sqrt{2}$
○ D: $1/\sqrt{3}$

17. (1 + sec θ) (1 - cos θ) = ?

○ A: sin θ ○ B: cot θ
○ C: cot θ cos θ ○ D: tan θ sin θ

18. sec (-7π/4) = ?

○ A: √2 ○ B: -√2
○ C: 2/√3 ○ D: - 2/√3

19. If the length of a chord of a circle is equal to the radius of that circle, the angle subtended (in radians) at the centre of the circle by the chord is?

○ A: 1 ○ B: π/2
○ C: π/3 ○ D: π/6

20. The value of cos1° * cos2° * cos3° ...... cos179° is ?

○ A: 0 ○ B: 1
○ C: 2 ○ D: -1

TEST 3

1. The perimeter of a certain sector of a circle is equal to half that of the circle of which it is a part. The circular measure of the angle of the sector is?

○ A: π ○ B: π - 2
○ C: 2π/3 ○ D: π - 4

2. tan 3x - tan 2x - tan x is equal to?

○ A: tan x / (tan 2x * tan 3x) ○ B: $(\tan x)^3$
○ C: (tan 3x + tan 2x + tan x) - (tan x * tan 2x)
○ D: tan x * tan 2x * tan 3x

3. sin 75° = ?

○ A: $\frac{\sqrt{2}(\sqrt{3}+1)}{4}$ ○ B: $\frac{\sqrt{2}(\sqrt{3}-1)}{4}$
○ C: √3/4 ○ D: -√3/4

4. The equation sin x cos x = 2 has?

○ A: One solution ○ B: Two solutions
○ C: Infinite solutions. ○ D: No solution.

5. cos (x+y) sin (x-y) = ?

○ A: 1/2 (sin 2x - sin 2y) ○ B: 1/2 (sin 2y - sin 2x)
○ C: sin 2x - sin 2y ○ D: sin 2x + sin 2y

6. tan (294°) = ?

○ A: cot 32° ○ B: - cot 32°
○ C: - cot 24° ○ D: cot 24°

7. If sin A + sin B = x and cos A + cos B = y, cos(A - B) is equal to ?

○ A: $x^2 + y^2 - 2$ ○ B: $(x^2 + y^2 - 2) / 2$
○ C: $(2 - x^2 + y^2) / 2$ ○ D: $(2 - x^2 - y^2) / 2$

8. Period of cot (3x) - sin (4x) is?

○ A: πq
○ B: π/2
○ C: π/3
○ D: π/4

9. $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = ?$

○ A: 1
○ B: 2
○ C: tan 2θ
○ D: cot 2θ

10. (1 - cos α) / sin α = ?

○ A: cos α/2
○ B: sin α/2
○ C: sec α/2
○ D: tan α/2

11. 8 sin x/8 cos x/2 cos x/4 cos x/8 = ?

○ A: 4 sin x
○ B: sin x
○ C: cos x
○ D: 8 cos x

12. What is the domain of $\sqrt{\sin^{-1}2x + \pi/6}$ **?**

○ A: [1/4 , 1/2]
○ B: [-1/4 , 1/2]
○ C: [1/8 , 1/2]
○ D: [-1/8 , 1/2]

13. cos 12° + cos 48° = ?

○ A: 2 cos 30° cos 18°
○ B: - 2 cos 30° cos 18°
○ C: 2 cos 30° sin 18°
○ D: - 2 cos 30° sin 18°

14. If (x $\sin^3 \alpha$ + y $\cos^3 \alpha$) = sin α cos α and (x sin α - y cos α = 0), then $x^2 + y^2$ = ?

○ A: 0
○ B: 2
○ C: -1
○ D: 1

15. If $\sin^2\theta$ + 3 cosθ - 2 = 0, $\cos^3\theta + \sec^3\theta$ is equal to?

○ A: 18
○ B: 9
○ C: 6
○ D: 3

16. The value of tan 1° * tan 2° * tan 3° ...... tan 89° = ?

○ A: 0
○ B: 1
○ C: -1
○ D: 1/2

17. If cos (A - B) = 3/5 and tan A . tan B = 2 then ?

○ A: cos A cos B = 1/5
○ B: sin A sin B = -2/5
○ C: cos (A + B) = 1/5
○ D: sin A sin B =4/5

18. sin 2α / (1 + cos 2α) = ?

○ A: cot α
○ B: tan α
○ C: sec α
○ D: csc α

19. Find the value of $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$

○ A: tan 3θ
○ B: cot 3θ
○ C: tan 6θ
○ D: cot 6θ

20. $\dfrac{\tan\alpha + \tan\beta}{\tan\alpha - \tan\beta} = ?$

○ A: sin (α + β) / sin (α - β) ○ B: sin (α - β) / sin (α + β)

○ C: cot (α + β) ○ D: sin α / sin (α - β)

TEST 4

1. tan (15°) = ?

○ A: (√3 + 1) / (√3 - 1) ○ B: (√3 - 1) / (√3 + 1)

○ C: √3 / (√3 + 1) ○ D: 1/3√3

2. The bottom of a pendulum describes an arc 3 ft long when the pendulum swings through an angle of 1/5 radian. The length of the pendulum in feet is ?

○ A: 15 ft ○ B: 12 ft

○ C: 5/3 ft ○ D: 3/5 ft

3. tan (π/4 + θ) tan (3π/4 + θ) is equal to ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

4. If tan 2 A = cot (A - 18°), then the value of A is?

○ A: 18° ○ B: 24°

○ C: 27° ○ D: 36°

5. What is the period of sec 9x ?

○ A: π ○ B: 2π/9

○ C: π/9 ○ D: π/18

6. If cot θ > 0 and sin θ < 0 then θ lies in the ?

○ A: Quadrant I ○ B: Quadrant II

○ C: Quadrant III ○ D: Quadrant IV

7. If α, β and γ are the angles of a triangle then tan (α + β) - tan γ = ?

○ A: 2 tan γ ○ B: - 2 tan γ

○ C: 0 ○ D: 1

8. 1 radian = ?

○ A: 60° ○ B: 59°

○ C: 58° ○ D: 57°

9. 6'' in radians = ?

○ A: π / 216000 radians ○ B: π / 108000 radians

○ C: π / 648000 radians ○ D: π / 3600 radians

10. The radius of a circle is 8 in. Find the angle in radians that an arc of 1 ft subtends in the center of this circle?

○ A: 1/8 ○ B: 2/8

○ C: 3/2 ○ D: π/6

11. In a triangle ABC, A = 45°, then the value of (1 + cot B) (1 + cot C) is equal to ?

○ A: 0
○ B: 1
○ C: -1
○ D: 2

12. If tan θ = - 4/3, sin θ = ?

○ A: -4/5 but not 4/5
○ B: 4/5 but not -4/5
○ C: 4/5 or - 4/5
○ D: Undefined.

13. Which of the following is true for $0^o \leq \theta < 90^o$?

○ A: 1/sec θ > 1
○ B: 1/cosec θ < 1
○ C: sec θ = 0
○ D: 1/cos θ < 1

14. Which of the following is true about θ in the quadrant II?

csc θ is positive, cos θ is positive, tan θ is positive

○ A: i only
○ B: i and ii only
○ C: ii and iii only
○ D: None of them is true

15. Domain of csc θ is θ Є R except θ = ?

○ A: nπ where n Є Z
○ B: [(2n+1)/2] π where n Є Z
○ C: nπ/2 where n Є Z
○ D: (2n+1/2)π where n Є Z

16. If sec θ + tan θ = x then tan θ = ?

○ A: $(x^2 - 1) / x$
○ B: $(x^2 + 1) / x$
○ C: $(x^2 + 1) / 2x$
○ D: $(x^2 - 1) / 2x$

17. Which of the following is not possible?

○ A: sin θ = ¾
○ B: tan θ = 75
○ C: cosec θ = 5/3
○ D: $\cos\theta = (1 + t^2) / (1 - t^2)$

18. The value of $\sin^2 \pi/8 + \sin^2 3\pi/8 + \sin^2 5\pi/8 + \sin^2 7\pi/8$ is?

○ A: -1
○ B: 0
○ C: 1
○ D: 2

19. If tan A = 1/2, then tan 2A is equal to?

○ A: 1
○ B: 1/2
○ C: 4/3
○ D: 5/4

20. If A = B = C = 60° then $\dfrac{tanA + tanB + tanC}{tanA * tanB * tanC}$ = ?

○ A: 0
○ B: 1
○ C: -1
○ D: √3

Inverse Trigonometric Function

TEST 1

1. Which of the following is true?

$\sin^{-1} x = (\sin x)^{-1,}$ $\cos^{-1} x = (\cos x)^{-1,}$ $\tan^{-1} x = (\cot x)^{-1}$

○ A: i and ii only

○ B: ii only

○ C: i, ii and iii

○ D: None of them is true.

2. $\cos^{-1} A + \cos^{-1} B$ = ?

○ A: $cos^{-1}(AB - \sqrt{(1 + A^2)(1 + B^2)})$

○ B: $cos^{-1}(AB + \sqrt{(1 - A^2)(1 - B^2)})$

○ C: $cos^{-1}(AB - \sqrt{(1 - A^2)(1 - B^2)})$

○ D: $cos^{-1}(AB + \sqrt{(1 + A^2)(1 + B^2)})$

3. Principal value of $\sin^{-1} (- \sqrt{3}/2)$ = ?

○ A: $-2\pi/3$

○ B: $-\pi/3$

○ C: $\pi/3$

○ D: $2\pi/3$

4. Range of $y = \sin^{-1} x$ is?

○ A: $- \pi/2 \leq y \leq \pi/2$

○ B: $- \pi \leq y \leq \pi$

○ C: $- \pi/4 \leq y \leq \pi/4$

○ D: $-1 \leq y \leq 1$

The value of $\tan^{-1} (- 1/\sqrt{3})$ is?

○ A: $\pi/3$

○ B: $- \pi/4$

○ C: $3\pi/4$

○ D: $- \pi/6$

5. What is the value of $\tan^{-1} 3/4 + \tan^{-1} 5/12$?

○ A: $\tan^{-1} 56/33$

○ B: $\tan^{-1} 16/33$

○ C: $\tan^{-1} 15/48$

○ D: $\tan^{-1} 16/63$

6. $y = \tan x$ is called principal tangent function if ?

○ A: - infinity < x < infinity

○ B: $- \pi < x < \pi$

○ C: $- \pi/2 < x < \pi/2$

○ D: $0 < x < \pi$

7. $\cos^{-1} (-1/2)$ = ?

○ A: $\pi/3$

○ B: $-2\pi/3$

○ C: $2\pi/3$

○ D: Both B and C.

8. Range of $y = \cos^{-1} x$ is?

○ A: $- \pi/2 \leq y \leq \pi/2$

○ B: $- \pi \leq y \leq \pi$

○ C: $0 \leq y \leq \pi/2$

○ D: $0 \leq y \leq \pi$

9. $2 \tan^{-1} A$ = ?

○ A: $\tan^{-1} 2A / (1 + A^2)$

○ B: $\tan^{-1} 2A / (1 - A^2)$

○ C: $\tan^{-1} A / (1 + A^2)$

○ D: $\tan^{-1} A / (1 - A^2)$

10. $\cos (\cos^{-1} 1/5)$ = ?

○ A: 1

○ B: 5

○ C: 1/5

○ D: 4/5

11. $\cos(\sin^{-1} 1/\sqrt{2}) = ?$

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{2}/3$
○ C: $2/\sqrt{3}$ ○ D: $1/2$

12. $\cos^{-1} A - \cos^{-1} B = ?$

○ A: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$
○ D: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

13. Which of the following function has domain ranging from - infinity to + infinity ?

○ A: $y = \sin^{-1} x$ ○ B: $y = \sec^{-1} x$
○ C: $y = \cos^{-1} x$ ○ D: $y = \tan^{-1} x$

TEST 2

1. The value of $\sec\left[\tan^{-1}\left(\frac{b+a}{b-a}\right) - \tan^{-1}\left(\frac{a}{b}\right)\right]$ is

○ A: $\sqrt{3}/2$ ○ B: $\sqrt{2}$
○ C: 1 ○ D: $1/\sqrt{3}$

2. If $y = \sin^{-1} x$ then $\cos(\sin^{-1} x) = ?$

○ A: $(1-x)^{1/2}$ ○ B: $(1-x)^{1/2}$
○ C: $(1-x^2)^{1/2}$ ○ D: $(1+x^2)^{1/2}$

3. $\cos[\tan^{-1} 1/3 + \tan^{-1} 1/2] = ?$

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{2}$
○ C: $\sqrt{3}/2$ ○ D: $1/2$

4. $\cot^{-1}(-1) = ?$

○ A: 1 ○ B: $\pi/2$
○ C: $2\pi/3$ ○ D: $3\pi/4$

5. Principal value of $\sin^{-1}(\sin 3\pi/5) = ?$

○ A: $3\pi/5$ ○ B: $4\pi/5$
○ C: $2\pi/5$ ○ D: $\pi/5$

6. What is the principal value of $\cot^{-1}(-1/\sqrt{3})$?

○ A: $3\pi/2$ ○ B: $\pi/3$
○ C: $\pi/6$ ○ D: $2\pi/3$

7. $\sin^{-1} 3/5 + \sin^{-1} 8/17 = ?$

○ A: $\sin^{-1}(11/23)$ ○ B: $\sin^{-1}(19/76)$
○ C: $\sin^{-1}(63/95)$ ○ D: $\sin^{-1}(77/85)$

8. Which of the following is Domain and Range of $y = \cot^{-1} x$?

○ A: Domain: $-\infty < x < \infty$ Range: $-\pi/2 < y < \pi/2$
○ B: Domain: $-1 < x < 1$ Range: $-\pi/2 < y < \pi/2$
○ C: Domain: $-\infty < x < \infty$ Range: $-\pi < y < \pi$
○ D: Domain: $-\infty < x < \infty$ Range: $0 < y < \pi$

9. Principal value of $\sin^{-1} [\sin (2\pi/3)] = ?$

○ A: $2\pi/3$
○ B: $-2\pi/3$
○ C: $\pi/3$
○ D: $\pi/6$

10. $\cos (\sin^{-1} 3/5) = ?$

○ A: $3/5$
○ B: $1/3$
○ C: $4/5$
○ D: $2/\sqrt{3}$

11. Range of $y = \tan^{-1} x$ is ?

○ A: $-\pi/2 < y < \pi/2$
○ B: $-\pi/2 \le y \le \pi/2$
○ C: $0 \le y \le 2\pi$
○ D: $0 < y < 2\pi$

12. $tan^{-1}\dfrac{a-b}{1+ab} + tan^{-1}\dfrac{b-c}{1+bc} = ?$

○ A: $\tan^{-1} a - \tan^{-1} c$
○ B: $\tan^{-1} a - \tan^{-1} b$
○ C: $\tan^{-1} b - \tan^{-1} c$
○ D: $\tan^{-1} c - \tan^{-1} a$

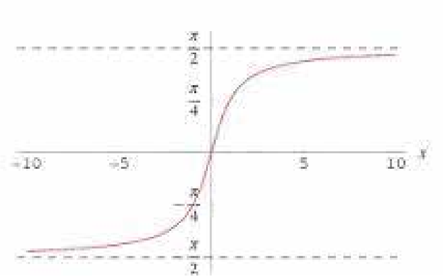
13. If $\alpha = 2\cos^{-1} 4/5$ then $\sin \alpha = ?$

○ A: $3/5$
○ B: $24/25$
○ C: $4/5$
○ D: $30/25$

14. $sin^{-1}(2x\sqrt{1-x^2}) = ?$

○ A: $\sin^{-1} x$
○ B: $2 \sin^{-1} x$
○ C: $3 \sin^{-1} x$
○ D: $4 \sin^{-1} x$

15. The graph below is for which function?



○ A: $y = \sin^{-1} x$
○ B: $y = \cos^{-1} x$
○ C: $y = \tan^{-1} x$
○ D: $y = \cot^{-1} x$

16. If $\tan^{-1} (1 + x) + \tan^{1} (1 - x) = \pi/2$ then $x = ?$

○ A: 0
○ B: 1
○ C: -1
○ D: $\sqrt{3}$

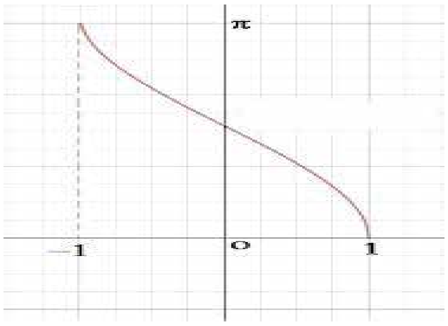
17. $y = \sec x$ is called a principal secant function if?

○ A: $-\pi \le x \le \pi$ and $x \ne \pi/2$ or $-\pi/2$
○ B: $-\pi/2 < x < \pi/2$
○ C: $0 \le x \le \pi$ and $x \ne \pi/2$
○ D: $0 \le x < \pi/2$

18. If $\alpha = \sin^{-1} 5/13$, then $\cos \alpha = ?$

○ A: $8/13$
○ B: $7/13$
○ C: $11/13$
○ D: $12/13$

19. The graph below is for which function?



○ A: $\sin^{-1} x$ ○ B: $\cos^{-1} x$

○ C: $\tan^{-1} x$ ○ D: $\cot^{-1} x$

20. $\operatorname{cosec}^{-1}(-2/\sqrt{3}) = ?$

○ A: $\pi/3$ ○ B: $-\pi/3$

○ C: $4\pi/3$ ○ D: $-4\pi/3$

TEST 3

1. $\sin(\sin^{-1} 1/5 + \cos^{-1} x) = 1$ then $x = ?$

○ A: 2/5 ○ B: 1/3

○ C: 1/5 ○ D: 1/2

2. $\sin(2\cos^{-1} x) = ?$

○ A: $2x\sqrt{1-x^2}$ ○ B: $2x\sqrt{1-x}$

○ C: $\frac{2x}{\sqrt{1-x^2}}$ ○ D: $\frac{2x}{\sqrt{1+x^2}}$

3. Domain and range of $y = \csc^{-1} x$ is ?

○ A: Domain : $-\infty < x < \infty$ Range : $-\pi/2 \le y \le \pi/2$

○ B: Domain : $-1 \le x \le 1$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ C: Domain : $1 \le |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ D: Domain : $1 > |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

4. $\sin(\cos^{-1} -2/3) = ?$

○ A: $1/\sqrt{2}$ ○ B: $\sqrt{5}/3$

○ C: $1/\sqrt{3}$ ○ D: $\sqrt{3}$

5. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, what is the value of x?

○ A: 1/6 ○ B: -1

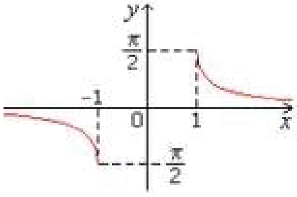
○ C: -1 and 1/6 ○ D: 1

6. $\cos^{-1}(\cos 7\pi/6) = ?$

○ A: $7\pi/6$ ○ B: $\pi/6$

○ C: $5\pi/6$ ○ D: $\pi/3$

7. **The graph below is for which function?**



○ A: $y = \tan^{-1} x$ ○ B: $y = \cot^{-1} x$

○ C: $y = \sec^{-1} x$ ○ D: $y = \csc^{-1} x$

8. **If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$, then $\cos^{-1} x + \cos^{-1} y$ is equal to ?**

○ A: $2\pi/3$ ○ B: $3\pi/2$

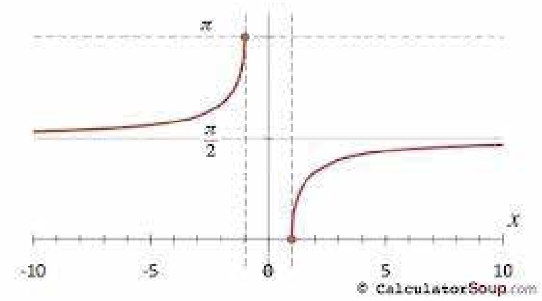
○ C: $\pi/5$ ○ D: $\pi/3$

9. **$\tan^{-1}(-x) = ?$**

○ A: $\tan^{-1}(x)$ ○ B: $-\tan^{-1}(x)$

○ C: $-\cot^{-1}(x)$ ○ D: $\cot^{-1}(x)$

10. **The graph below is for which function?**



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○ A: $y = \tan^{-1} x$ ○ B: $y = \cot^{-1} x$

○ C: $y = \csc^{-1} x$ ○ D: $y = \sec^{-1} x$

11. **$\tan(\sin^{-1} x) = ?$**

○ A: $x / (1-x^2)$ ○ B: $x / (1-x)$

○ C: $\frac{x}{\sqrt{1+x^2}}$ ○ D: $\frac{x}{\sqrt{1-x^2}}$

12. $\sin\left[\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right] =$

○ A: $\sqrt{3}/2$ ○ B: $-\sqrt{3}/2$

○ C: ½ ○ D: - 1/2

13. **The value of $\tan(\cos^{-1}(4/5) + \tan^{-1}(2/3))$ is equal to ?**

○ A: 7/5 ○ B: 17/6

○ C: 17/18 ○ D: Cannot be determined.

14. **The value of $\tan^{-1}1 + \tan^{-1} 2 + \tan^{-1} 3$ is ?**

○ A: $\pi/2$ ○ B: -1

○ C: 1 ○ D: 0

15. tan ($\sin^{-1}$ -3/4) = ?

○ A: 3/√5
○ B: -3/√5
○ C: 3/√7
○ D: -3/√7

16. Value of cos ($\tan^{-1}$ 15/8 - $\sin^{-1}$ 7/25) = ?

○ A: 114/350
○ B: 297/425
○ C: 215/345
○ D: 138/147

17. The product of the roots of the equation $\tan^{-1}$ (2x) + $\tan^{-1}$ (3x) = 3π/4 is ?

○ A: -1/6
○ B: -1/2
○ C: 1
○ D: 3

Function And Limits

TEST 1

1. If f(x,y,z)=2x+3y-z and f(a,b,0)=f(0,a,b), then b / a equals

○ A: 0
○ B: 2
○ C: ½
○ D: 1/4

2. Range of the function $f(x) = \sqrt{36 - x^2}$ is

○ A: $[0, -\infty]$
○ B: $[\infty, -\infty]$
○ C: $[0, 6]$
○ D: $[36, 1]$

3. If f(x) = $3x^2$ - 2x + 4, f(-2) =

○ A: -2
○ B: 20
○ C: 4
○ D: 12

4. If g(x) = x^3 - x^2 - x - 1, then the value of g(-1) is:

○ A: 0
○ B: 1
○ C: -2
○ D: 2

5. Let f(x) = $3x^2$ + 4, g(x) = 2 and h={(1,2),(2,1),(3,2)}.

○ A: f(x) is the only function.
○ B: f(x) and g(x) are the only functions.
○ C: f(x), g(x) and h(x) are all functions.
○ D: None of these are functions.

6. If f(x)=3 and g(x)=2, then f(g(x))=

○ A: 2
○ B: 3
○ C: 6
○ D: 5

7. Range of the function $f(x) = 2x - 3$ is

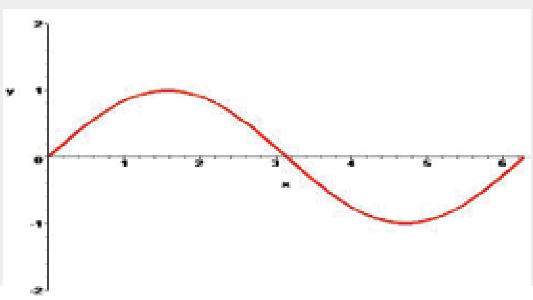
○ A: $(-\infty, +\infty)$
○ B: [2,3]
○ C: [2,10]
○ D: None of the above.

8. If f(x)=2x+3 and g(x) = x^2 - 1, then f(g(2))=

○ A: 4 ○ B: 9

○ C: 13 ○ D: 19

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If p(x)=4x-6 and p(a)=0, then a=

○ A: 3 ○ B: 2

○ C: 3/2 ○ D: 2/3

11. If f(x)=x and g(x)=x.f(x), then f(x) / g(x) =

○ A: x ○ B: 1/x

○ C: 1 ○ D: None of the above.

12. If $f(x) = x^7 - 97x^6 - 199x^5 + 99x^4 + 2x + 195$, $f(-1)$ equals:

○ A: 24 ○ B: 154

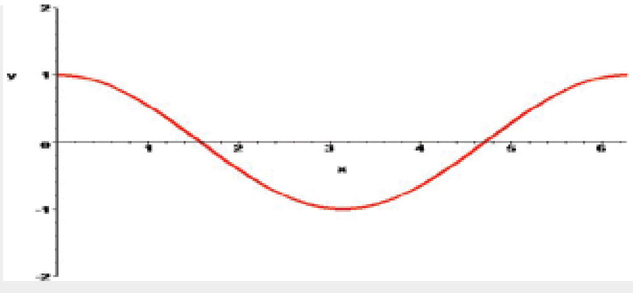
○ C: 272 ○ D: 393

13. What value(s) must be excluded for the domain of f={(x,y):y=$\frac{x+2}{x-2}$}?

○ A: 2 ○ B: -2

○ C: 0 ○ D: 2 and -2

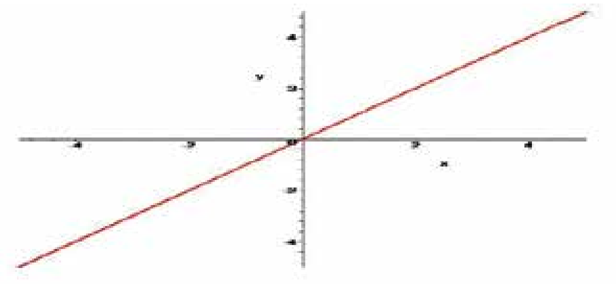
14. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the Above

16. If f(1) = 1 and f(2) = 2 and f(-1) = -1, then f(x) would be:

○ A: 0 ○ B: 1

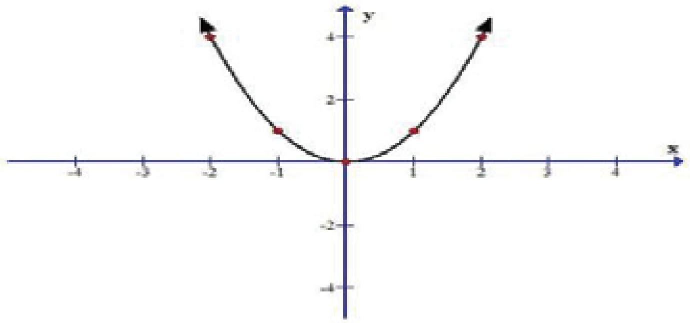
○ C: 2 ○ D: x

17. If $f(r,\theta) = r\cos\theta,\ f(2, \frac{\pi}{3}) =$

○ A: 2π ○ B: 1

○ C: $\frac{\pi}{6}$ ○ D: $\frac{1}{2}$

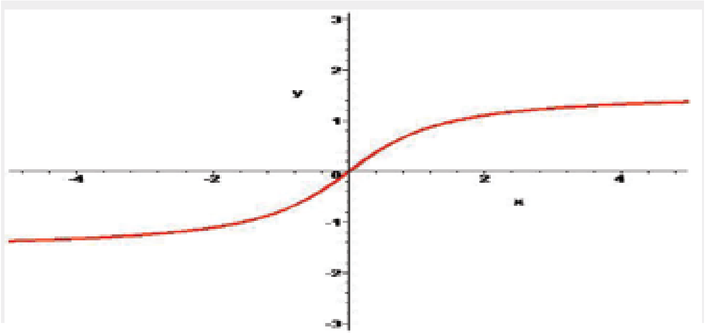
18. Which of the following functions represents the plot shown?



○ A: $f(x) = x^2$ ○ B: $f(x) = x^2 - x - 5$

○ C: $f(x) = x^3$ ○ D: None of the above.

19. The following figure shows a graph of which type of function?



○ A: Cosecant ○ B: Secant

○ C: Cotangent ○ D: Arctangent

20. If $f(x, y, z) = x^2 + y^2 - 2z$ for all real numbers x, y and z, then f(-1,-1,-1)=

○ A: 0 ○ B: 2

○ C: 4 ○ D: 6

TEST 2

1. If f(x,y)=3x+2y-8 and g(z) = z^2 for all real numbers x,y,z then f(3,g(4))=

○ A: 15
○ B: 33
○ C: 45
○ D: 25

2. For a function to be even as well as odd, it must be:

○ A: Symmetric about origin (by 180^0)
○ B: Symmetric about y-axis (by 180^0)
○ C: Both A and B
○ D: None of the above

3. If g(x)=3 and $f(x) = \dfrac{1}{3x+2}$, then f(g(3))=

○ A: 1/11
○ B: 1/17
○ C: 3/5
○ D: 9/11

4. Which statement is correct for the following functions?

$$f(x) = \frac{2}{7}x^2, \qquad g(x) = -x^3$$

○ A: Both I and II are even.
○ B: Both I and II are odd.
○ C: I is even and II is odd.
○ D: I is odd and II is even.

5. If f(x) = x+3 and g(x) = x^2 , for what value of does f(g(x))=g(f(x))

○ A: 1
○ B: 0
○ C: -1
○ D: 2

6. Which of the following relations are said to be odd?

$y=x^2 + 1$, $y=\sin(x)$, $y = x^3 - x + 1$

○ A: Only II.
○ B: Only I & II.
○ C: Only I & III.
○ D: Only II & III.

7. Find the inverse of $g(x) = \dfrac{2x}{x-1}$

○ A: $g^{-1}(y) = \dfrac{y+5}{y-2}$
○ B: $g^{-1}(y) = \dfrac{y}{y-2}$
○ C: $g^{-1}(y) = \dfrac{y-7}{y}$
○ D: $g^{-1}(y) = \dfrac{y+4}{y-2}$

8. If f(x) = x^2 + 3x - 4 and g(x)=x-4, then f(g(x))=

○ A: $2x^2 - 3x + 2$
○ B: $2x^2 - 3x$
○ C: $x^2 - 5x + 10$
○ D: $x^2 - 5x$

9. Find $\lim\limits_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1}$

○ A: ¼
○ B: 1/2
○ C: 1
○ D: 2

10. Assuming that $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ exist, which of the following is correct:

○ A: If $f(x) \geq 0$, then $\lim_{x \to a} f(x) \geq 0$

○ B: If $f(x) \geq g(x)$, then $\lim_{x \to a} f(x) \geq \lim_{x \to a} g(x)$

○ C: If $f(x) \geq 0$, then $\lim_{x \to a} \sqrt{f(x)} = \sqrt{\lim_{x \to a} f(x)}$

○ D: All are correct.

11. If {(3,2),(4,2),(3,1),(7,1),(2,3)} is to be a function, which of the following must be removed from the set?

○ A: (3,2) ○ B: (4,2)

○ C: (2,3) ○ D: None of the above.

12. To show a function is discontinuous, we can do one of three things:

Show that the function fails the sequence definition, Show that the function fails the ε -> δ definition

Prove by contradiction by relating it to a function known to be discontinuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

○ C: None of these are correct. ○ D: (i), (ii) and (iii) are correct.

13. If f(x,y)=x+y and g(x,y)=x-y, then f(g(2,1),f(2,-1)) equals:

○ A: 0 ○ B: 1

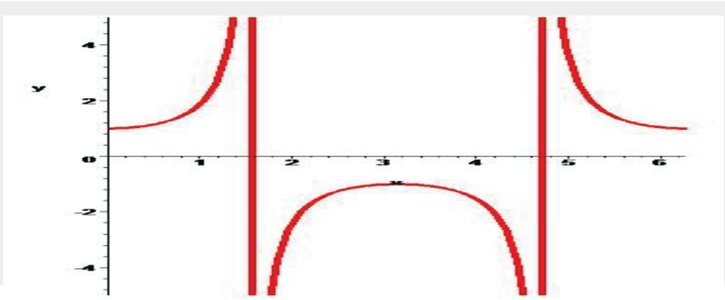
○ C: 2 ○ D: 4

14. Range of the function f(x)= sin (x) is

○ A: [-1,1] ○ B: $[-\frac{\pi}{2}, \frac{\pi}{2}]$

○ C: [0,1] ○ D: None of the above.

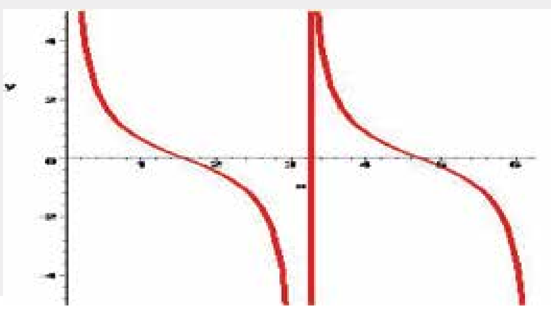
15. The following figure shows a graph of which type of function?



○ A: Tangent ○ B: Secant

○ C: Cosecant ○ D: Cosine

16. The following figure shows a graph of which type of function?



○ A: Cotangent ○ B: Arctangent

○ C: Cosecant ○ D: Tangent

17. f(x)=cos x, g(x)=sin x, h(x) = ±√x

○ A: f(x) is the only function.

○ B: g(x) is the only function.

○ C: f(x) and g(x) are the only function.

○ D: All three are functions.

18. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is not true:

○ A: $\lim_{x\to a}(f(x) \pm g(x)) = \lim_{x\to a} f(x) \pm \lim_{x\to a} g(x)$

○ B: $\lim_{x\to a}(f(x)g(x)) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$

○ C: $\lim_{x\to a} \dfrac{f(x)}{g(x)} = \dfrac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$

○ D: $\lim_{x\to a} |f(x)| = -\left|\lim_{x\to a} f(x)\right|$

19. If $f(x, y) = 2x^2 - y^2$ and $g(x) = 2^x$, which of the following equal 2^{2x} ?

○ A: f(x,g(x))

○ B: f(g(x),x)

○ C: f(g(x),g(x))

○ D: f(g(x),0)

20. If $f(x) = 4x + 2$ for all x, then for x=0.5 $f^{-1}(x) =$?

○ A: 4

○ B: $\frac{1}{16}$

○ C: $\frac{1}{4}$

○ D: $-\frac{3}{8}$

TEST 3

1. If g(x-1)= $x^2 + 2$, then g(x)=

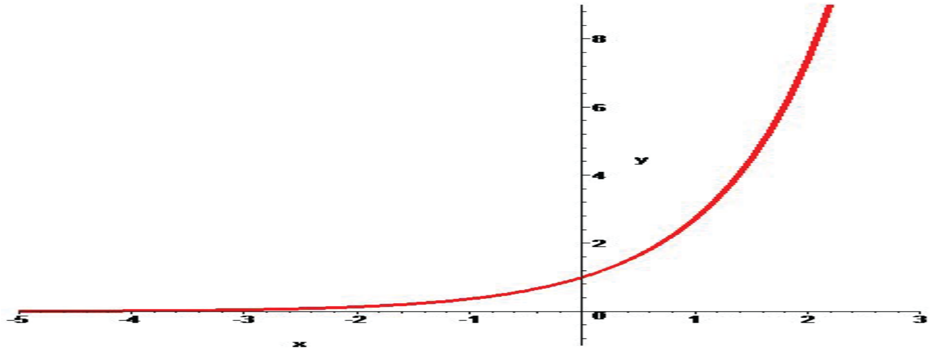
○ A: $x^2 - 2x + 3$

○ B: $x^2 + 2x + 3$

○ C: $x^2 - 2x + 6$

○ D: $x^2 - 2x$

2. The following figure shows graph of which type of function?



○ A: Log Function

○ B: Exponential Growth

○ C: Exponential Decay

○ D: None of the above.

3. If $f(x) = 3x - 5$ and $g(y) = y^2 - 1$, then f(g(z)) equals

○ A: $(3z-5)^2 - 1$　○ B: $3z^2 - 8$

○ C: $3z^3 - 5z^2 - 3z + 8$　○ D: $x^2 + 3z - 8$

4. $\lim\limits_{x\to 0} \dfrac{\cos(2x) - 1}{\cos x - 1}$ **= ?**

○ A: 2　○ B: 4

○ C: 8　○ D: 10

5. $\lim\limits_{h\to 0} \dfrac{\cos h - 1}{h} =$

○ A: -1　○ B: 0

○ C: 1　○ D: 2

6. $\lim\limits_{x\to 0} \dfrac{x^4 + 5x - 3}{2 - \sqrt{x^2 + 4}}$ **= ?**

○ A: 6　○ B: 15

○ C: ∞　○ D: None of the above.

7. If f(x) = x^2 - 4, for what real number values of x will f(f(x))=0?

○ A: $\sqrt{6}$　○ B: $\pm\sqrt{6}$

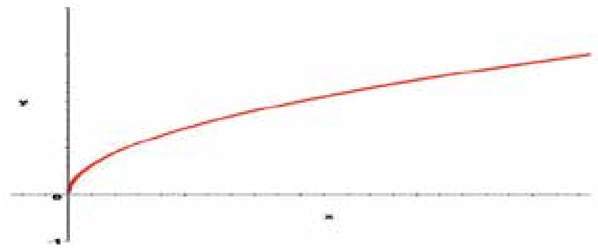
○ C: $\pm\sqrt{2}or\pm\sqrt{6}$　○ D: No values

A straight line function, whose graph bisects the second and the fourth quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: a　○ B: -a

○ C: -2a　○ D: 0

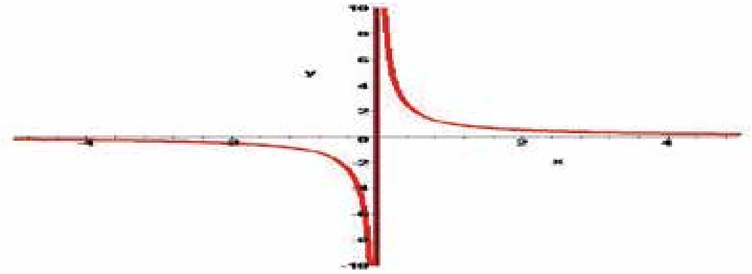
8. The following figure may show a graph of which function?



○ A: $y = \sqrt{x}$　○ B: $y = \sqrt[6]{x}$

○ C: $y = \sqrt[5]{x}$　○ D: Both A and B.

9. The figure shown below depicts a graph of which of the following functions?



○ A: $y=x+5$ ○ B: $y = x^2 / (x+2)$

○ C: $y = x^3 - 4$ ○ D: $y = 1 / x^3$

10. If $f(x) = 2^x$, then $f(\log_2 5)=$

○ A: 2^5 ○ B: 2^2

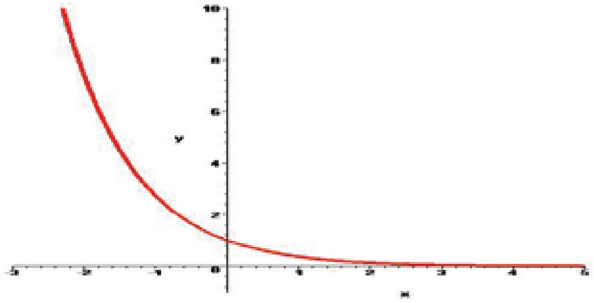
○ C: 2 ○ D: 5

11. If f is a linear function and f(1)=-2,f(-2)=1 and f(x)=1.5, what is x?

○ A: 0.5 ○ B: -0.5

○ C: -1.5 ○ D: -2.5

The wing figure shows a graph of which type of function?



○ A: Log function ○ B: Exponential Growth

○ C: Exponential Decay ○ D: None of the above.

12. If $f(x) = 3 - 2x + x^2$, then $\dfrac{f(x+t) - f(x)}{t}$ equals

○ A: t-x+4 ○ B: t+2

○ C: t+2x-2 ○ D: 2x-2

13. To show a function is continuous, we can do one of three things:

Show it satisfies the sequence definition of continuity, Show it satisfies the ε -> δ definition of continuity

Decompose it into simpler functions we already know to be continuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

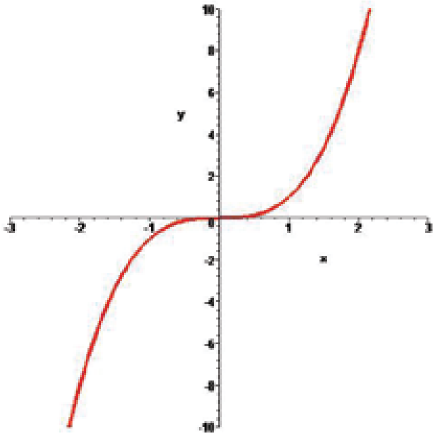
○ C: (i), (ii) and (iii) are correct. ○ D: None of these are correct.

14. **If $f(x) = \left\{\begin{array}{lll} \frac{5}{x-2} & when & x \neq 2 \\ k & when & x = 2 \end{array}\right\}$, what must the value 'k' equal in order that f(x) be a continuous** function?

○ A: 2 ○ B: 5

○ C: 0 ○ D: No value of k will make f(x) a continuous function.

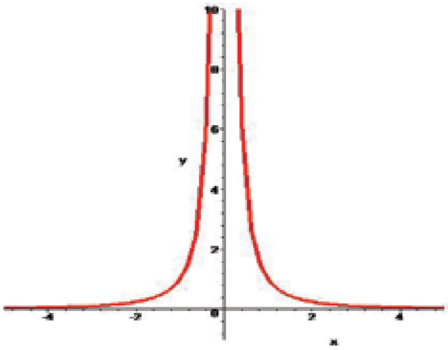
15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the above.

16. The figure shown below depicts a graph of which of the following functions?



○ A: $y = x^2 + 2x + 3$ ○ B: $y = 1 / x^2$

○ C: $y = 1 / x^3$ ○ D: None of the above.

17. If $f(x) = \dfrac{3x-1}{2}$ and f(g(x))=x, then g(x)=

○ A: $\dfrac{2x-1}{3}$ ○ B: $\dfrac{2x+1}{3}$

○ C: $\dfrac{2x}{3}+1$ ○ D: $\dfrac{2x}{3}-2$

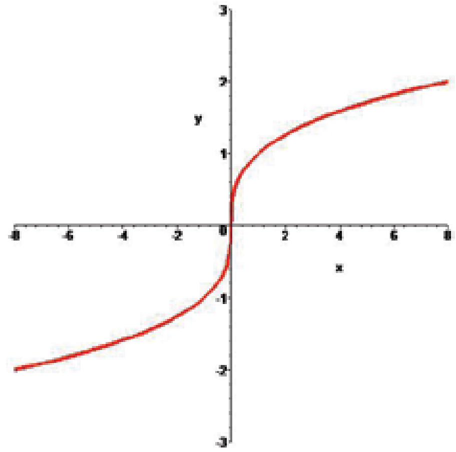
18. A straight line function, whose graph bisects the first and the third quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: 0 ○ B: 1

○ C: a ○ D: 2a

TEST 4

1. **The figure shown may depict a graph of which of the following functions?**



○ A: $y = \sqrt[3]{x}$

○ B: $y = \sqrt[4]{x}$

○ C: Both A and B.

○ D: None of the above.

2. **Find** $\lim\limits_{x\to\infty} \dfrac{x^2+5x+1}{2x^2-10}$

○ A: 1/6

○ B: 1/4

○ C: ½

○ D: 1

3. **Domain of the function f(x) =** $5x^3 + 4x^2 + 2x - 5$ **is:**

○ A: (-∞ , +∞)

○ B: (-4,4)

○ C: (-5,5)

○ D: None of the above.

4. **f={(x,y):y=4}, g={(x,y):**$x^2 - y^2$**=1}, and h={(x,y):x=3}, which of the these is a function?**

○ A: f only

○ B: g only

○ C: h only

○ D: f and h only

5. **If f(x) =** $x^2 + 1$ **and f(g(x))=4x-3, then g(x)=**

○ A: $2\sqrt{x} - 1$

○ B: $2\sqrt{x-1}$

○ C: $\sqrt{x-1}$

○ D: x-4

6. **If g(x)=3x+2 and g(f(x))=x, then f(2)=**

○ A: 2

○ B: 6

○ C: 0

○ D: 8

7. **If f(x,y)=2x-y and g(z)=sin z, then** $g(f(\pi, \frac{\pi}{2}))$ **equals:**

○ A: 0

○ B: -1

○ C: 1

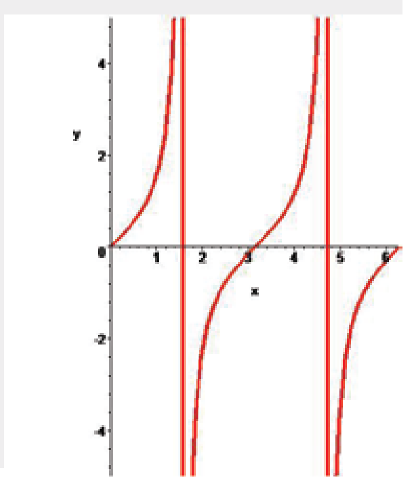
○ D: 2

8. Which of the following is the inverse of the function $f(x) = \sqrt{x} - 1$, for all x>0?

○ A: $(x+1)^2$ ○ B: $x^2 + 2$

○ C: x+1 ○ D: x-2

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If $f(x) = x - \frac{1}{x}$, then $f(a) - f(\frac{1}{a})$ equals:

○ A: 0 ○ B: 2a - 2/a

○ C: a - 1/a ○ D: 1

11. If f(x)=2x-3, the inverse of f(x) could be represented by:

○ A: $f^{-1}(x) = 3x - 2$ ○ B: $f^{-1}(x) = \frac{1}{2x-3}$

○ C: $f^{-1}(x) = \frac{x+2}{3}$ ○ D: $f^{-1}(x) = \frac{x+3}{2}$

12. What value(s) must be excluded for the domain of $\frac{f}{g}(x)$ if $f(x) = 3x^2 - 4x + 1$ and $g(x) = 3x^2 - 3$?

○ A: 0 ○ B: 3

○ C: 1 ○ D: both ±1

13. $\lim\limits_{x=3} = \frac{5x^2 - 8x - 13}{x^2 - 5}$ **= ?**

○ A: 0 ○ B: 5

○ C: -2 ○ D: 2

14. If f(g(x)) = x^2 - 10 and g(x)=x+3 , then f(x)=

○ A: $x^2 + 6x + 8$ ○ B: $x^2 - 6x - 1$

○ C: $x^2 - 6x$ ○ D: $x^2 + 8$

15. If f(x)=x, the inverse of f, f^{-1}, could be represented by:

○ A: $f^{-1}(x) = x$ ○ B: $f^{-1}(x) = 1$

○ C: $f^{-1}(x) = y$ ○ D: $f^{-1}(x) = \frac{1}{x}$

16. If f(x) = x^3 - 4, then the inverse of f=

○ A: $-x^3 + 4$ ○ B: $\sqrt[3]{x+4}$

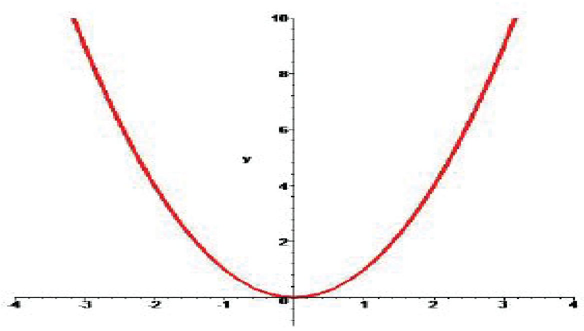
○ C: $\sqrt{x-4}$ ○ D: $\frac{1}{x-4}$

17. Find $\lim_{x \to 4} \frac{x^2 - 6x + 8}{x - 4}$**.**

○ A: -2 ○ B: 0

○ C: 2 ○ D: 4

18. The following figure shows graph of which type of function?



○ A: Linear function ○ B: Even degree polynomial

○ C: Inverse of even degree polynomial ○ D: Inverse of odd degree polynomial

19. Find $\lim_{x \to \infty} \frac{3x^2 + 1}{4x^3 + 2x + 1}$

○ A: 0 ○ B: 4

○ C: 10 ○ D: 15

20. If f(x) = ax^2 + bx + c and f(1) = 3 and f(-1) = 3, then a+c equals

○ A: -3 ○ B: 0

○ C: 3 ○ D: 6

Differentiation

TEST 1

1. $\lim\limits_{x\to 0} \dfrac{1-\cos x}{x} = ?$

○ A: 1 ○ B: 0

○ C: -1 ○ D: Infinity

2. d/dx f(x).g(x) = ?

○ A: f(x).g(x) ○ B: f'(x).g(x) + f(x).g'(x)

○ C: f'(x).g(x) - f(x).g'(x) ○ D: f'(x).g'(x) + f(x).g(x)

3. d/dx $\mathbf{Sin^{-1} x}$ = ?

○ A: $1/(1-x^2)^{1/2}$ ○ B: $-1/(1-x^2)^{1/2}$

○ C: $1/(1+x^2)^{1/2}$ ○ D: $-1/(1+x^2)^{1/2}$

4. What is the derivative of $\mathbf{(2x + 3)^5}$?

○ A: $10(2x + 3)^4$ ○ B: $10(2x + 3)^6$

○ C: $5(2x + 3)^4$ ○ D: $5(2x + 3)^6$

5. dy/dx of f(x) = log(log (x)) is ?

(Please assume log as "Log to the base e" or Ln)

○ A: 1 / log x ○ B: x / log x

○ C: 1 / (x log x) ○ D: 2 / log x

6. $\dfrac{d}{dx} log(\sin x) = ?$

○ A: tan x ○ B: cot x

○ C: 1 / sin x ○ D: 1 / cos x

7. If $\mathbf{y=e^x}$, then the rate of change of y with respect to x at point (0,1) is?

○ A: e ○ B: 1

○ C: -1 ○ D: 2

8. Under which of the following condition the given expression is true?

$$\frac{f(x_1) - f(x)}{x_1 - x} = f'(x)$$

○ A: As x approaches the value of x_1. ○ B: As x_1 approaches the value of x.

○ C: As x approaches the value of 0. ○ D: Both A and B.

9. $\lim\limits_{\Delta x\to 0} \dfrac{f(x+\Delta x) - f(x)}{\Delta x} = ?$

○ A: f'(x) ○ B: ∫ f(x)dx

○ C: ∫ f'(x)dx ○ D: None of the above.

10. If y = 1/ x^2 then dy/dx at x = -2 is ?

○ A: ¼ ○ B: 1

○ C: ½ ○ D: -1/2

11. d/dx sin x at x = π/2 is?

○ A: 1 ○ B: -1

○ C: √2/2 ○ D: 0

12. d/dx ($\cos^2 x + \sin^2 x$) = ?

○ A: 2 sin x + 2 cos x ○ B: 0

○ C: 2 sin x cos x ○ D: 1

13. Which of the following statement is false?

○ A: d/dx c = 0 ; where c is a constant. ○ B: d/dx [c f(x)] = c d/dx f(x)

○ C: d/dx [f(x) * g(x)] = d/dx f(x) * d/dx g(x)

○ D: d/dx [f(x) + g(x)] = d/dx f(x) + d/dx g(x)

14. Who is/or thought to be the inventor of differential calculus and fundamental theorums of calculus?

○ A: Albert Einstien. ○ B: Isaac Newton.

○ C: Gottfried Leibniz ○ D: Both B and C.

15. Derivative of ln e^{4x} w.r.t x is?

○ A: 4 ○ B: 4x

○ C: $1/e^{4x}$ ○ D: e^{4x}

16. The slope of a curve at point P = 7. If dx = 0.01 and it is very close to P then dy =?

○ A: 0 ○ B: 0.7

○ C: 0.07 ○ D: 0.49

17. The equation of a line is y = 9/4 x - 33. What is the property of dy/dx?

○ A: It is increasing. ○ B: It is decreasing.

○ C: It is a constant value. ○ D: It is first increasing and then decreasing.

18. $\dfrac{d}{dx}x^n \;=?$

○ A: nx ○ B: nx^n

○ C: nx^{n-1} ○ D: $1/n+1\ x^{n+1}$

19. What is the derivative of 1/ $(ax + b)^n$?

○ A: -n $(ax + b)^{-n-1}$ ○ B: - an $(ax + b)^{n-1}$

○ C: -an $(ax + b)^{-n-1}$ ○ D: -n $(ax + b)^{n-1}$

20. $\lim\limits_{\Delta x\to 0}\dfrac{f(x+\Delta x)-f(x)}{\Delta x} =?$

○ A: f' (x) ○ B: dy / dx

○ C: ∫ f''(x)dx ○ D: All of the above.

TEST 2

1. **If the tangent to the graph of f(x) at the point "a" makes an angle of 45° with the x-axis, then what is the value of f'(x)?**

○ A: 0
○ B: 1
○ C: 2
○ D: Not enough information.

2. **The function f(x) = cot (x) sin (x) has how many stationary points in the interval [0 , 2π]?**

○ A: 0
○ B: 1
○ C: 2
○ D: 3

3. **Which of the following is the correct expansion of sin x as Maclaurin series?**

○ A: $1 - x + x^2 - x^3$ ....
○ B: $x - x^3/3! + x^5/5! - x^7/7!$ .....
○ C: $1 + x/1! - 2x/2! + 3x/3!$ .....
○ D: $1 + 0.1x + 0.01x + 0.001x$ ....

4. **Which of the following is not true?**

○ A: $a = d^2s/dt^2$
○ B: $a = dv/dt$
○ C: $v = \int a\,dt$
○ D: $v = \int s\,dt$

5. $\frac{d}{dx}(\frac{a+x}{a-x}) \;=?$

○ A: 0
○ B: $2(a+x) / (a-x)^2$
○ C: $2a / (a-x)^2$
○ D: $a / (a-x)^2$

6. **What are the two positive integers, whose sum is hundred and product is maximum?**

○ A: 30, 70
○ B: 45, 55
○ C: 43, 57
○ D: 50, 50

7. **Value of e is equal to which of the following infinite series?**

○ A: 1 + 1/1! + 1/2! + 1/3! ...
○ B: 1 + 0.1 + 0.01 + 0.001 ...
○ C: $1 - 1^3/3! + 1^5/5! - 1^7/7!$ ....
○ D: 1! - 2! + 3! - 4! ...

8. **What is the derivative of $(1 + \tan^2\theta)$ w.r.t tan θ?**

○ A: 2 sec θ
○ B: 2 tan θ
○ C: $\sec^2\theta$
○ D: $2\tan\theta\sec^2\theta$

9. **Which of the following is not true for function $f(x) = |4 - x^2|$?**

○ A: Function value is always positive.
○ B: Function is continuous.
○ C: Function is differentiable at x = +2 and -2.
○ D: Its domain is the set of all real numbers.

10. $\frac{d}{dx}e^{e^x} \;=?$

○ A: $e^x e^{e^x}$
○ B: e^{e^x}
○ C: e^{2x}
○ D: $1/e^x$

11. $\frac{d}{dx}tan^{-1}\sqrt{\frac{1-cos\,x}{1+cos\,x}}$ =?

○ A: 1 ○ B: 2

○ C: ½ ○ D: -1/2

12. Maximum value of (ln x) / x is ?

○ A: 0 ○ B: 1

○ C: e ○ D: 1/e

The maximum area of a rectangle of perimeter 176 cm is?

○ A: 1854 cm^2 ○ B: 1936 cm^2

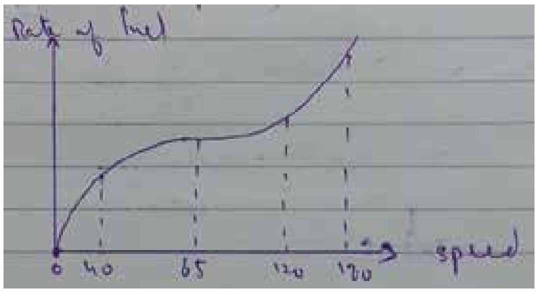
○ C: 2110 cm^2 ○ D: 3246 cm^2

13. What is the derivative of $(x^3+1)^9$?

○ A: $9(x^3+1)^8$ ○ B: $10(x^3+1)^{10}$

○ C: $9x^2\,(x^3+1)^8$ ○ D: $27x^2\,(x^3+1)^8$

14. The graph below shows the rate of fuel consumption with respect to the speed of the car. What is the most efficient speed with repect to the fuel consumption?



○ A: 40 ○ B: 65

○ C: 120 ○ D: 180

15. Critical point on the graph is the point for which?

○ A: f'(x) = 0 ○ B: f'(x) does not exist

○ C: f'(x) = 1 ○ D: Both A and B.

16. Derivative of an even function is always ?

○ A: An odd function ○ B: An even function

○ C: Negative function ○ D: Could be even or odd

17. If distance s of an object is given by the function $s=100t - 25t^2$, then what is the velocity at t= 1/2?

○ A: 25 ○ B: 50

○ C: 75 ○ D: 100

18. $x^2 + y^2 = 4$ is the equation of a circle. What is the slope at a point where x = 0?

○ A: 0 ○ B: 2

○ C: 4 ○ D: 1/2

19. If y = f(f(x)) ; f(0) = 0 and f'(0) = 1, then y'(0) is equal to ?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 1/2

TEST 3

1. If $y = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \_\_\_ \infty\right)$, then $\frac{dy}{dx} =$

○ A: 0 ○ B: 1
○ C: x ○ D: y

2. The function $x^3 + x^2 - 5x - 5$ is increasing at which interval?

○ A: (-infinity , - 5/3] ○ B: [1 , infinity)
○ C: [-5/3 , 1] ○ D: Both A and B.

3. d/dx cos(cos(cos x))) = ?

○ A: -sin [cos (cos x)].sin x cos x ○ B: - cos [sin (sin x)] sin x sin x
○ C: -sin [cos (cos x)] sin (cos x) sin x ○ D: sin [cos (cos x)] cos (cos x)

4. $\frac{d}{dx}[\cos^{-1}(4x^3 - 3x)] = ?$

○ A: $\frac{3}{\sqrt{1-x^2}}$ ○ B: $\frac{-3}{\sqrt{1-x^2}}$
○ C: $\frac{3}{\sqrt{1+x^2}}$ ○ D: $\frac{-3}{\sqrt{1+x^2}}$

5. y = |cos x| is not differentiable for x = ? (n in the given choices represent a set of integers)

○ A: nπ/2 ○ B: (2n+1) π/2
○ C: nπ ○ D: (n+1) π

6. If $y = e^{2x + 3 \log x}$, then dy/dx is equal to?

○ A: $x^2 e^{2x} (2x + 3)$ ○ B: $x^2 e^{2x} (2x - 3)$
○ C: $x^3 e^{2x}$ ○ D: $x^2 e^{2x}\, 2x$

7. If x > 0 and xy = 1, then the minimum value of (x + y) is?

○ A: -2 ○ B: -1
○ C: 1 ○ D: 2

8. The point at which the curve $y = x^3 - 4x + 3$ has gradient 8 is?

○ A: (2,3) ○ B: (4,5)
○ C: (1,0) ○ D: (0,1)

9. If x = (cos θ + θ sinθ), y = (sinθ - θ cos θ), then dy/dx is equal to ?

○ A: tan θ ○ B: cot θ
○ C: sin θ ○ D: cos θ

10. $\frac{d}{dx}\left(tan^{-1}\sqrt{\frac{1 + cos\, x}{1 - cos\, x}}\right) = ?$

○ A: -1 ○ B: 1
○ C: ½ ○ D: -1/2

11. The graph f(x)=cot x has critical points at which of the following points in the interval [0,π]?

○ A: 0 and π　○ B: 0 and π/2
○ C: π and π/2　○ D: π/4 and π/2

12. The minimum value of $(x^2 + 250/x)$ = ?

○ A: 75　○ B: 50
○ C: 5　○ D: The function has no minimum value.

13. tan x is ____ function in the interval [0,π/2]?

○ A: Increasing　○ B: Decreasing
○ C: Constant　○ D: Discontinuous

14. The function $x^3 - 27x + 5$ is increasing when?

○ A: $|x| > 3$　○ B: $|x| < 3$
○ C: $x < -3$　○ D: $x > 3$

15. If $y = \tan^{-1}(\sqrt{1 + x^2} + x)$, then $\frac{dy}{dx}$ = ?

○ A: $1 / 2(1+x^2)$　○ B: $-1 / 2(1+x^2)$
○ C: $1 / 2(1-x^2)$　○ D: $2 / (1-x^2)$

16. The point on the curve y = √x at which the tangent makes an angle of 45° with x axis is?

○ A: (1,1)　○ B: (1/16,1/4)
○ C: (4,2)　○ D: (1/4, 1/2)

17. If $y = 12x^9 + 13x^7 + 5x^5 + 19$ then which of the following is true?

○ A: $d^5y/dx^5 = 0$　○ B: $d^7y/dx^7 = 0$
○ C: $d^9y/dx^9 = 0$　○ D: $d^{10}y/dx^{10} = 0$

18. If x > 0, y > 0 and x + y = 18, then the maximum value of xy is?

○ A: 77　○ B: 81
○ C: 85　○ D: 144

19. If √x + √y = √a then dy/dx = ?

○ A: $(y/x)^{1/2}$　○ B: $(x/y)^{1/2}$
○ C: $-(y/x)^{1/2}$　○ D: $-(x/y)^{1/2}$

20. Derivative of $a^{\sqrt{x}}$ = ?

○ A: $a^{\sqrt{x}} \ln a$　○ B: $a^{\sqrt{x}}$
○ C: $a^{\sqrt{x}} / \ln a$　○ D: $a^{\sqrt{x}} \ln a / 2\sqrt{x}$

TEST 4

1. **What is $d^{19}y/dx^{19}$ if $y = e^{-x}$?**

○ A: e^{-x} ○ B: $-e^{-x}$

○ C: $19e^{-x}$ ○ D: $-19e^{-x}$

2. **The position of an object is given by $x = 15t - 5t^3$ where x is the position. What is the acceleration of the object when it is momentarily at rest?**

○ A: 0 ○ B: 1

○ C: 15 ○ D: -30

3. **A rectangle has perimeter 100m. Its maximum area would be?**

○ A: 480 m^2 ○ B: 625 m^2

○ C: 690 m^2 ○ D: 765 m^2

4. **The maximum value of function $f(x) = \sin x \cos x$ is?**

○ A: 1 ○ B: 2

○ C: ½ ○ D: 0

5. **If $x = \log t$ and $y = t^2 - 1$, then the value of d^2y/dx^2 at $t = 1$ is?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. **What is the second derivative of $(3t + 2)^{-2}$ with respect to t?**

○ A: $-6(3t + 2)^{-3}$ ○ B: $6(3t + 2)^{-4}$

○ C: $54(3t + 2)^{-3}$ ○ D: $54(3t + 2)^{-4}$

7. **What is the derivative of sin x w.r.t cos x?**

○ A: cos x ○ B: tan x

○ C: - cot x ○ D: - cos x sin x

8. **d/dx sin x^o = ? (x is in degrees)**

○ A: cos x^o ○ B: x cos x^o

○ C: (- π/180) cos x^o ○ D: (π/180) cos x^o

9. $\frac{d}{dx}e^{ln\,sin\,x^2} =?$

○ A: $2x \cos x^2$ ○ B: $x \cos x^2$

○ C: $\cos x^2$ ○ D: $1/\sin x * 2\, e^{\sin x}$

10. **If $d/dx\,(3x^3 + x) = d/dx\,(-3x^2 - 5)$ then x = ?**

○ A: 1 or 2 ○ B: -1/3

○ C: 0 or -1/3 ○ D: 0 or 1

11. **$d(x^x) / dx$ = ?**

○ A: x^x (1 + log x) ○ B: 1 + log x

○ C: log x ○ D: x log x

12. If $y = 3x^2 - 12x + 8$ then the slope of tangent at point (3,-1) is?

○ A: -18 ○ B: 6
○ C: -19 ○ D: 8

13. The curve y = sin (x) with domain = set of all real numbers has how many stationary points?

○ A: Infinite ○ B: 0
○ C: 1 ○ D: 2

14. The derivative of e^x sinx w.r.t. e^x is

○ A: cos x + sin x ○ B: cos x
○ C: sin x ○ D: e^x(sin x + cos x)

15. If $\sin x = \dfrac{t}{\sqrt{1+t^2}}$, then $\dfrac{dx}{dt}$ is equal to

○ A: 1 ○ B: $1 / (1+t^2)$
○ C: $1 / (1 - t)^{1/2}$ ○ D: $1 / (1 + t^2)^{1/2}$

16. Differentiating $\ln(x^2 + 2x)$ w.r.t x gives?

○ A: $1 / (x^2+2x)$ ○ B: ln (2x + 2)
○ C: (2x+2) / x ○ D: $(2x+2) / (x^2+2x)$

17. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \ldots \text{to } \infty}}}$, then $\dfrac{dy}{dx}$ is equal to

○ A: x / (2y - 1) ○ B: x / (2y + 1)
○ C: log x / (2y - 1) ○ D: 1 / x(2y - 1)

18. If $y = \tan^{-1}\left(\dfrac{\sqrt{1+x^2}-1}{x}\right)$ and $\theta = \tan^{-1}x$, then $\dfrac{dy}{d\theta} = ?$

○ A: 1 ○ B: 1/2
○ C: -1/2 ○ D: x/2

19. What is the derivative of $(x^2 + 1)(x^3 + 7)$ w.r.t x is?

○ A: $5x^3 + 15x + 14$ ○ B: $5x^4 + 3x^2 + 14x$
○ C: $6x^3$ ○ D: $6x^3 + 7$

20. The graph of function $y = x^3$ has a _____ point at x = 0 ?

○ A: Inflection ○ B: Stationary
○ C: Turning ○ D: Both A & B.

Integration

TEST 1

1. **∫ f(x)g'(x) dx = ?**

   ○ A: f(x)g(x) - ∫ g(x)f'(x) dx
   ○ B: f(x)g(x) + ∫ g(x)f'(x) dx
   ○ C: f(x)g(x) - ∫ g'(x)f(x) dx
   ○ D: f(x)g(x) + ∫ g'(x)f(x) dx

2. **∫ cot x dx = ?**

   ○ A: ln |cos x| + c
   ○ B: ln |sec x| + c
   ○ C: ln |sin x| + c
   ○ D: ln |cosec x| + c

3. $\int_0^{3\pi/2} cos(x)dx \ =?$

   ○ A: 0
   ○ B: 1
   ○ C: 3
   ○ D: -1

4. $\int \frac{\tan \sqrt{x}}{\sqrt{x}}\, dx =$

   ○ A: ln |cos √x|
   ○ B: 2 ln |cos √x|
   ○ C: ln |sec √x|
   ○ D: 2 ln |sec √x|

5. **The solution of the differential equation dy/dx = 2xy is?**

   ○ A: $y = ce^{-x^2}$
   ○ B: $y = ce^{x^2}$
   ○ C: $y^2 = 2x^2 + c$
   ○ D: None of the above.

6. $\int_0^{\pi} sin(x)dx \ =?$

   ○ A: 0
   ○ B: 1
   ○ C: 2
   ○ D: √2

7. **∫ $(3x^2$ - 2x + 1) dx = ?**

   ○ A: $x^3 - x^2 + 1 + c$
   ○ B: $x^3 - x + 1 + c$
   ○ C: $x^3 - x^2 + x + c$
   ○ D: $x^3 + x^2 + x + c$

   ∫ sec x tan x dx =?

   ○ A: tan x + c
   ○ B: cot x + c
   ○ C: cosec x + c
   ○ D: sec x + c

8. $\int_{-2}^{3} x^2dx \ =?$

   ○ A: 8/3
   ○ B: 19/3
   ○ C: 28/3
   ○ D: 35/3

9. If $f(x) = x^2$ then find dy when x = 3 and dx = 0.01?

○ A: 0.02
○ B: 0.04
○ C: 0.06
○ D: 0.08

10. $\int tan^2 x \, dx \;\; =?$

○ A: 2 tan x $\sec^2$ x + c
○ B: tan x + x + c
○ C: tan x - x + c
○ D: None of the above.

11. $\int [f(x)]^{-1} f'(x)dx$ = ? (f(x) > 0)

○ A: f(x) + c
○ B: ln | ln f(x) | +c
○ C: ln f(x) + c
○ D: $[f(x)]^{n+1}$ / (n+1)

12. $\int_1^2 (2x^5 - x + 3)dx \;\; =?$

○ A: 45/2
○ B: 39/2
○ C: 17/2
○ D: None of the above.

13. $\int$ dx/(ax + b) =?

○ A: ln|ax + b| + c
○ B: 1/a ln|ax + b| + c
○ C: 1/b ln|ax + b| + c
○ D: 1/a ln|a| + c

14. Which of the following mathematical function gives the area under the curve?

○ A: Differentiation
○ B: Integration
○ C: Vector product
○ D: Both B and C.

15. $\int x \, sinx \, dx \;\; =?$

○ A: x sin x + cos x + c
○ B: - x sin x + cos x + c
○ C: x cos x + sin x + c
○ D: - x cos x + sin x + c

16. $\int \frac{x}{(1+x^4)} dx =$

○ A: $\tan^{-1} x^2$ + c
○ B: 1/2 $\tan^{-1} x^2$ + c
○ C: $\cot^{-1} x^2$ + c
○ D: 1/2 $\cot^{-1} x^2$ + c

17. $\int (2x + 3)^{1/2}$ dx = ?

○ A: 1/3 $(2x + 3)^{3/2}$ + c
○ B: 1/2 $(2x + 3)^{3/2}$ + c
○ C: 1/3 $(2x + 3)^{1/2}$ + c
○ D: 2/3 $(2x + 3)^{3/2}$ + c

18. $\int$ tan x $\sec^2$x dx = ?

○ A: $\sec^2$x / 2 + c
○ B: $\tan^2$x / 2 + c
○ C: $\tan^2$x
○ D: 1/2 $(\cos x)^2$

19. What is the solution of the equation?

(sin y) (cosec x) dy/dx = 1

○ A: sin y = sin x + c
○ B: sin y = - sin x + c
○ C: cos y = cos x + c
○ D: cos y = - cos x + c

TEST 2

1. $\int \frac{1-x^2}{1+x^2}dx$ **= ?**

○ A: $x + \mathrm{Tan}^{-1} x + c$

○ B: $x - \mathrm{Tan}^{-1} x + c$

○ C: $-x + 2\mathrm{Tan}^{-1} x + c$

○ D: $-x - 2\mathrm{Tan}^{-1} x + c$

2. $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx \ =?$

○ A: 20/3

○ B: 14/3

○ C: 8/3

○ D: 5/3

3. The family of curve $y = Ax + A^3$ is represented by the differential equation of degree?

○ A: 1

○ B: 2

○ C: 3

○ D: 4

4. $\int \frac{\cos x - \sin x}{\cos x + \sin x} dx \ =?$

○ A: $- \ln (\cos x - \sin x) + c$

○ B: $- \ln (\cos x + \sin x) + c$

○ C: $\ln (\cos x - \sin x) + c$

○ D: $\ln (\cos x + \sin x) + c$

5. $\int \frac{\cos x}{\sqrt{1 + \sin x}} dx = ?$

○ A: $- (1+\sin x)^{1/2} + c$

○ B: $2(1+\sin x)^{1/2} + c$

○ C: $0.5 (1+\sin x)^{1/2} + c$

○ D: $- 0.5 (1+\sin x)^{1/2} + c$

6. $\int a^{\lambda x + y} dx =?$

○ A: $1/(\lambda \ln a)\, a^{\lambda x + y} + c$

○ B: $1/(\ln a)\, a^{\lambda x + y} + c$

○ C: $1/(\lambda \ln a)\, a^{x + y} + c$

○ D: $1/(\ln a)\, a^{x + y} + c$

7. The order of a differential equation whose solution is y = a cos x + b sin x, where a and b are arbitrary constants, is?

○ A: 1

○ B: 2

○ C: 3

○ D: Cannot be determined.

8. $\int x \ln x \, dx = ?$

○ A: $0.5 x^2 (\ln x - 0.5) + c$

○ B: $x^2 (\ln x + 0.5) + c$

○ C: $1.5 x (\ln x + 1) + c$

○ D: $x^2 (\ln x - x) + c$

9. The order and the degree of the differential equation $d^2s/dt^2 + 4 = 0$ are?

○ A: Order is 2 and degree is 2

○ B: Order is 2 and degree is 3

○ C: Order is 1 and degree is 2

○ D: None of the above.

10. $\int \ln (\tan x) \sec^2 x \, dx = ?$

○ A: $\ln (\tan x) + \tan x + c$

○ B: $\tan x \ln (\tan x) - \tan x + c$

○ C: $\ln (\tan x) - \sec x + c$

○ D: $\tan x \ln (\tan x) + \tan x + c$

11. $\int \frac{1-\tan^2 x}{1+\tan^2 x} dx =$

○ A: sin 2x
○ B: 1/2 sin 2x
○ C: cos 2x
○ D: 1/2 cos 2x

12. The solution of the differential equation $\frac{dy}{dx} + \frac{1+\cos 2y}{1-\cos 2x} = 0$ is

○ A: tan y + cot x = c
○ B: tan y . cot x = c
○ C: tan y - cot x = c
○ D: tan y = c . cot x

13. Which of the following is an ordinary differential equation?

○ A: $2y + 8x = \frac{d(cosx)}{dx}$
○ B: $\frac{d(y+x)}{dx} = x^2 + \sin x$
○ C: $\frac{d(\cos x + \tan x)}{dx} = x + 2y$
○ D: All of the above.

14. $\int \sec^2 x \operatorname{cosec}^2 x \, dx$ = ?

○ A: tan x cot x
○ B: tan x + cot x
○ C: tan x - cot x
○ D: - tan x cot x

15. $\int \tan^2 x \, dx$ = ?

○ A: tan x + x + c
○ B: tan x - x + c
○ C: $\sec^2 x - x + c$
○ D: $\operatorname{cosec}^2 x + x + c$

16. $\int \frac{1}{(1+x^2)Tan^{-1}x} dx \;\; =?$

○ A: $1/x \ln |Tan^{-1} x| + c$
○ B: $-1/x \ln |Tan^{-1} x| + c$
○ C: $- \ln |Tan^{-1} x| + c$
○ D: $\ln |Tan^{-1} x| + c$

17. The solution of the differential equation y dy/dx = x - 1, satisfying x = 1 and y = 1, is?

○ A: $y^2 = 2x^2 - x - 1$
○ B: $y^2 = x^2 - 2x + 2$
○ C: $y = x^2 - 2x + 3$
○ D: $y^2 = 2x^2 - x - 3$

18. $\int ln\, x\, dx \;\; =?$

○ A: x (1 – ln x) + C
○ B: x (ln x - 1) + C
○ C: (1 + x) ln x + C
○ D: (1 - x) ln x + C

19. A particle moves in a straight line with a velocity given by dx/dt = x + 1 (x is the distance described). The time taken by a particle to traverse a distance of 99 meters is?

○ A: log 10e
○ B: 2 $\log_e 10$
○ C: 2 log 10 e
○ D: 0.05 log10 e

20. The number of arbitrary constants in the second order differential euqation is?

○ A: 0
○ B: 1
○ C: 2
○ D: Infinite

TEST 3

1. $\int \frac{cos2x - 1}{1 + cos2x} dx \ = ?$

○ A: - tan x + x + c
○ B: tan x + x + c
○ C: x - sec x + c
○ D: x + sec x + c

2. $\int e^{-ln\,x}\, dx \ = ?$

○ A: $e^{-\ln x}$
○ B: ln |x|
○ C: $-e^{-\ln x}$
○ D: $-x\, e^{-\ln x}$

3. $\int_0^1 \frac{dx}{(1+x^2)^{3/2}} \ = ?$

○ A: 1
○ B: √2
○ C: 1/√2
○ D: 3/√2

4. The solution of the equation $(e^x + 1)y\, dy = (y + 1)e^x\, dx$ is ?

○ A: $y = e^x(e^x + 1) + C$
○ B: $(y + 1) = e^{2x} + C$
○ C: $y = e^x / x + C$
○ D: $C\,(1 + y)(1 + e^x) = e^y$

5. The differential equation of all circles of radius 'r' is of order?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. What is the solution of the differential equation,

$(x\sqrt{1+y^2})dx + (y\sqrt{1+x^2})dy = 0$

○ A: $(1+y^2)^{1/2} + (1 + x^2)^{1/2} = c$
○ B: $\log(1 + y^2) + \log(1 + x^2) = 2c$
○ C: $\sin^{-1} y + \sin^{-1} x = c$
○ D: $\tan^{-1} y + \tan^{-1} x = c$

7. $\int \frac{e^{tan^{-1}x} dx}{1 + x^2}$ **= ?**

○ A: $xe^{tan^{-1}x} + c$
○ B: $(tan^{-1}x)e^{tan^{-1}x} + c$
○ C: $tan^{-1}x + c$
○ D: $e^{tan^{-1}x} + c$

8. $\int_0^{2\pi} cos^2\theta\, d\theta \ = ?$

○ A: π
○ B: 2π
○ C: 3π/2
○ D: 3

9. $\int_0^{\pi} \sqrt{1 + sin\ x}\, dx \ = ?$

○ A: 2
○ B: 4
○ C: √2
○ D: 2√2

10. $\int |x|\, dx = ?$

○ A: $x^2 / 2$
○ B: $- x^2 / 2$
○ C: $x |x| / 2$
○ D: 1

11. $\int \frac{\sec x \operatorname{cosec} x}{\log \tan x} dx =$

○ A: $\log [\log \tan x] + C$
○ B: $\cot (\log x) + C$
○ C: $\tan (\log x) + C$
○ D: None of the above.

12. If $\int x^6 \sin(5x^7)dx = \frac{k}{5}\cos(5x^7),\ x \neq 0$, then

○ A: $k = -1/7$
○ B: $k = 1/7$
○ C: $k = -7$
○ D: $k = 7$

13. $\int \frac{dx}{e^x + e^{-x}} \;=?$

○ A: $\log (e^x + 1) + C$
○ B: $\log (e^x + e^{-x}) + C$
○ C: $\tan^{-1} e^x + C$
○ D: $\sin^{-1} e^x + C$

14. The value of $\int \frac{(x - x^3)^{1/3}}{x^4} dx$ is

○ A: $(3/8) (1/x^2 - 1)^{4/3} + C$
○ B: $- (3/8) [(1/x^2) - 1]^{4/3} + C$
○ C: $(1/8) (1 - 1/x^2)^{4/3} + C$
○ D: $- (1/8) (1 - 1/x^2)^{4/3} + C$

15. $\int \frac{\cos x}{\sin x \,.\, \ln \sin x} dx \;=?$

○ A: $- \ln |\ln \sin x|\, dx$
○ B: $- \ln |\ln \cos x|\, dx$
○ C: $\ln |\ln \sin x|\, dx$
○ D: $\ln |\ln \cos x|\, dx$

16. $\int_0^{2\pi} \sqrt{1 + \sin(x/2)}\, dx \;=?$

○ A: 2
○ B: 4
○ C: 8
○ D: 0

17. $\int \sin^{-1} x\, dx \;=?$

○ A: $x \cos^{-1} x + (1 - x^2)^{1/2} + C$
○ B: $x \sin^{-1} x + C$
○ C: $x \sin^{-1} x + (1 - x^2)^{1/2} + C$
○ D: $- \sin^{-1} x + (1 - x^2)^{1/2} + C$

18. $\int_0^{\pi/2} \sin x\, e^{\cos x} dx \;=?$

○ A: 1
○ B: $e - 1$
○ C: e
○ D: -1

19. $\int \frac{xe^x}{(1+x)^2}dx \ =?$

○ A: $(1 + 2x\ e^x) / (1 + x)$

○ B: $(1 - 2x\ e^x) / (1 + x)$

○ C: $- e^x / (1+x)$

○ D: $e^x / (1+x)$

20. The equation of the curve through the point (1, 0) and whose slope is $\frac{y-1}{x^2-x}$ is

○ A: (y - 1)(x + 1) + 2x = 0

○ B: 2x(y - 1) + x + 1 = 0

○ C: x(y - 1)(x + 1) + 2 = 0

○ D: y(y - 1)(x - 1) + 2 = 0

TEST 4

1. $\int \sqrt{1 + cos(x/4)}\, dx \ =?$

○ A: 8 √2 sin (x/8) + C

○ B: - 8 √2 sin (x/8) + C

○ C: 8 √2 cos (x/8) + C

○ D: - 8 √2 cos (x/8) + C

2. $\int_0^{\pi/2} sin^2 x\, dx \ =?$

○ A: π

○ B: π/2

○ C: π/3

○ D: π/4

3. $\int_0^{\pi} \sqrt{1 - cos\, x}\, dx \ =?$

○ A: 1

○ B: √2

○ C: 2√2

○ D: 2

4. $\int_0^{\pi/2} sin(x) sin(2x) dx \ =?$

○ A: 1/3

○ B: 2/3

○ C: 1

○ D: pi

5. Which of the following statement is false?

○ A: The degree of the differential equation is the highest power of the highest order differential coefficient occurring in it.

○ B: The order of the differential equation is the highest order derivative occurring in the equation.

○ C: The order of a differential equation is unique.

○ D: The order of a differential equation is any integer.

6. ∫ cos √x dx = ?

○ A: [√ x sin √x + cos √x] + C

○ B: 2[√x sin √x + cos √x] + C

○ C: [√ x sin √x - cos √x] + C

○ D: 2[√x sin √x - cos √x] + C

7. The differential equation $x\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y = x^2$ is of

○ A: Degree 4 and order 2 ○ B: Degree 4 and order 3

○ C: Degree 3 and order 2 ○ D: Degree 2 and order 3

8. What is the solution of the differential equation?

$x\,dy + y(x - 1)dx = 0$

○ A: $y = c\,xe^{x}$ ○ B: $y = c\,xe^{-x}$

○ C: $y = c\,e^{-x}$ ○ D: $y = c\,xe^{x+1}$

9. $\int [f(x)]^n f'(x)\,dx$ = ?

○ A: $\ln f(x) + c$ ○ B: $-\ln f(x) + c$

○ C: $[f(x)]^{n+1} / (n+1)$ ○ D: $[f(x)]^{n} / (n+1)$

10. $\int x^2 e^{x^3} \cos(e^{x^3})dx$ is equal to

○ A: $\frac{1}{3}sin(e^{x^3}) + c$ ○ B: $sin(e^{x^3}) + c$

○ C: $3sin(e^{x^3}) + c$ ○ D: $-sin(e^{x^3}) + c$

11. If dr/dt = - rt and r(0) = r_0, then which of the following is correct?

○ A: $r = r_o e^{-t}$ ○ B: $r = r_o e^{-t/2}$

○ C: $r = r_o e^{-t.t}$ ○ D: $r = r_o e^{-t.t/2}$

12. $\int \frac{e^{2x} + e^{x}}{e^{x}} dx \;=?$

○ A: $e^x + 1 + c$ ○ B: $2x\,e^x + c$

○ C: $e^{2x} + 1 + c$ ○ D: $e^x + x + c$

13. δy for any function f(x) is given by?

○ A: f(δx) ○ B: f(x + δx)

○ C: f(x + δx) + f(x) ○ D: f(x + δx) - f(x)

14. $\int_0^{\pi/2} cos^2 x\, dx \;=?$

○ A: π ○ B: π/2

○ C: π/3 ○ D: π/4

15. The solution of the equation y dx + x dy = 0 is?

○ A: xy = c ○ B: x/y = c

○ C: x + y = c ○ D: x - y = c

Analytic Geometry

TEST 1

1. Equation of a line parallel to x axis at a distance 'a' below the x axis is?

○ A: $x = a$ ○ B: $x = - a$

○ C: $y = - a$ ○ D: $y = a$

2. What is the equation of a line perpendicular to a line with slope = -6? The line has y intercept of 4/3.

○ A: $y = x + 8$ ○ B: $y = -6x + 4/3$

○ C: $6y = x + 8$ ○ D: $y = x + 3/4$

3. The angle bisectors of a triangle are?

○ A: Perpendicular ○ B: Concurrent

○ C: Non-concurrent ○ D: Parallel

4. The equation of family of lines perpendicular to line $3x + 4y + 7 = 0$, is?

○ A: $4x + 3y + k = 0$ ○ B: $4x - 3y + k = 0$

○ C: $3x - 4y + k = 0$ ○ D: $3x + 4y + k = 0$

5. If m_1 and m_2 are the slopes of the perpendicular lines. Which of the following is true?

○ A: $m_1 = m$ ○ B: $m_1 = - m_2$

○ C: $m_1m_2 -1 = 0$ ○ D: $m_1m_2 +1 = 0$

6. Angle between lines $2x^2 - 7xy + 3y^2 = 0$, is?

○ A: 45° ○ B: 60°

○ C: 90° ○ D: 30°

7. What is the distance between the points A (7,5) and B (2,-6) ?

○ A: $\sqrt{73}$ ○ B: $\sqrt{146}$

○ C: $\sqrt{183}$ ○ D: $\sqrt{219}$

8. Equation of x axis is?

○ A: $y = 0$ ○ B: $x = 0$

○ C: $x = y$ ○ D: $y = 1$

9. What is the y intercept of the line $x - \sqrt{3}y + 10 = 0$

○ A: $10/\sqrt{3}$ ○ B: $-10/\sqrt{3}$

○ C: 10 ○ D: -10

10. The mid point of line joining points A (3 ,1) and B(-2,-4) is?

○ A: (5/2 , 5/2) ○ B: (3/2, 1/2)

○ C: (-1, -2) ○ D: (1/2 , -3/2)

11. If inclination of a line is 45° then the slope is?

○ A: 0 ○ B: 1

○ C: -1 ○ D: Infinity.

12. The point (-4,-2) lies on a circle. What is the length of the radius of this circle if the center is located at (-8,-10)?

○ A: √47
○ B: √80
○ C: √95
○ D: √108

13. If two medians of a triangle ABC pass through point (1,-2) then the third median pass through?

○ A: (0,0)
○ B: (-2,1)
○ C: (-1,-2)
○ D: None of the above.

14. Which of the following statement is true about any triangle?

○ A: Altitudes and right bisectors are concurrent.
○ B: Altitudes and right bisectors are non-concurrent.
○ C: Altitudes are concurrent and right bisectors are not concurrent.
○ D: Altitudes are not concurrent and right bisectors are concurrent.

15. If m_1 and m_2 are the slopes of two lines then the tangent of angle between the lines is equal to?

○ A: $(m_2 - m_1) / (1 - m_1m_2)$
○ B: $(m_2 + m_1) / (1+m_1m_2)$
○ C: $(m_2 + m_1) / (1 - m_1m_2)$
○ D: $(m_2 - m_1) / (1+m_1m_2)$

16. In the straight equation x cos a + y sin a = P, P represents?

○ A: Y intercept
○ B: X intercept
○ C: Mid point of the line.
○ D: Length of perpendicular from the origin to the line

17. What is the point of intersection for 5x + 7y = 35 and 3x - 7y = 21?

○ A: (5,7)
○ B: (7,0)
○ C: (3,-7)
○ D: (4,3)

18. If points A(a,b) ; B(c,d) and C(e,f) are collinear. Then the area of the triangle ABC is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

19. The point p (x,y) such that x>0 and y <0 lies in?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

20. What is the slope of the line ax + by + c = 0?

○ A: 0
○ B: Infinite
○ C: -c/b
○ D: -a/b

TEST 2

1. What is the symmetric form of the equation 5x - 12y + 39 = 0?

○ A: $\frac{x+39/5}{12/13} = \frac{y}{5/13}$

○ B: $(-5/13)x + (12/13)y = 3$

○ C: $(-5/39)x + (12/39)y = 1$

○ D: $y = (5/12)x + (39/12)$

2. The equation of line parallel to x-axis and bisecting the join of (1, 4) and (− 2, 6) is?

○ A: $y = 3$

○ B: $y = 5$

○ C: $y + 2 = 5$

○ D: $x = 5$

3. What is the equation of a line passing through the point (4,2) and parallel to the line connecting points (0,-1) and (7,-15)?

○ A: $y + 2x + 10 = 0$

○ B: $y + 2x - 10 = 0$

○ C: $2y + 3x - 7 = 0$

○ D: $2y + 3x + 7 = 0$

4. The two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if?

○ A: $a_1b_2 - a_2b_1 = 0$

○ B: $a_1a_2 - b_1b_2 = 0$

○ C: $a_1b_2 + a_2b_1 = 0$

○ D: $a_1a_2 + b_1b_2 = 0$

5. The three lines $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if and only if?

○ A: $a_1 = a_2 = a_3$ and $b_1 = b_2 = b_3$ and $c_1 = c_2 = c_3$

○ B: $a_1 + b_1 + c_1 = 0$

○ C:

○ D:

6. If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then?

○ A: a = 0, b = 4

○ B: a = 3, b = 4

○ C: a = 2, b = 3

○ D: a = 3, b = 5

7. The equation of general form $ax^2 + 2hxy + by^2$ represents?

○ A: A line

○ B: A curve

○ C: A pair of lines

○ D: A pair of lines through the origin

8. Centroid of a triangle divides each median in the ratio?

○ A: 1:1

○ B: 1:2

○ C: 2:1

○ D: 1:3

9. Find the radius of a circle whose diameter has endpoints (-3, -2) and (7, 8)?

○ A: $10\sqrt{2}$

○ B: $2\sqrt{10}$

○ C: $5\sqrt{2}$

○ D: $2\sqrt{5}$

10. The angle between the pair of lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$ is?

○ A: None of the above.

○ B: $\tan^{-1}(4/3)$

○ C: $\tan^{-1}(11/3)$

○ D: $\tan^{-1}(7/3)$

11. Of $P_1(x_1,y_1)$ and $P_2=(x_2,y_2)$ are two points such that line joining P_1P_2 is parallel to x axis then?

○ A: $x_1 = x_2$

○ B: $y_1 = x_2$

○ C: $x_1 = y_2$

○ D: $y_1 = y_2$

12. The equation of a straight line that intersects x axis at point 2 and y axis at point -4 is?

○ A: $y - 2x + 4 = 0$

○ B: $y - 2x - 4 = 0$

○ C: $2x - y + 4 = 0$

○ D: $x - 2y + 4 = 0$

13. For a pair of lines represented by general equation $ax^2 + 2hxy + by^2$, if $h^2 > ab$ then?

○ A: Lines are real and distinct.

○ B: Lines are real and coincident.

○ C: Lines are imaginary.

○ D: Lines do not pass through the origin.

14. What is the equation of the line intersecting $3x - 4y - 10 = 0$ and $x + 2y - 10 = 0$ and having a zero slope?

○ A: $2x + 3y - 18 = 0$

○ B: $y = 2$

○ C: $x = 9$

○ D: $2x + 3y + 18 = 0$

15. Slope of a line is negative if the angle z it froms with the x axis is?

○ A: $z = 0$

○ B: $z > 90$

○ C: $0 < z < 90$

○ D: $90 < z < 180$

16. If three points A(a,b), B(c,d) and C(e,f) are collinear then?

○ A: Slope of AB is not equal to the slope of BC

○ B: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$

○ C: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 1$

○ D: None of the above.

17. The equation below shows which form of the straight line equation?

$$\frac{x - x_1}{\cos\alpha} = \frac{y - y_1}{\sin\alpha}$$

○ A: Normal form

○ B: Two point form

○ C: Symmetric form

○ D: Point slope form

18. What is the distance between two parallel lines $2x - 5y + 13 = 0$ and $2x - 5y + 6 = 0$?

○ A: 3/28

○ B: 9/32

○ C: $7/\sqrt{29}$

○ D: $4/\sqrt{63}$

19. What is the normal form of the straight line equation $5x - 12y + 39 = 0$?

○ A: This equation cannot be represented in the two point form.

○ B: $y = (5/12)\,x + 39/12$

○ C: $(-5/39)\,x + (12/39)\,y = 1$

○ D: $(-5/13)\,x + (12/13)\,y = 3$

20. The points of line $|x| = |y|$ may lie in which quadrant?

○ A: Quadrant I

○ B: Quadrant I & III

○ C: Quadrant II and IV

○ D: Quadrant I, II , III or IV

TEST 3

1. **Find the value of k in the equation (3x - 4y - 10) + k(x + 2y - 10) = 0 such that the line is perpendicular to a line with slope 3/4?**

○ A: 4
○ B: 5
○ C: 6
○ D: 7

2. **The pair of lines represented by the equation $2x^2 + 49xy - 2y^2$are?**

○ A: Imaginary.
○ B: Parallel
○ C: Perpendicular
○ D: None of the above.

3. **The straight lines given below form what kind of triangle?**

$x + y - 4 = 0, \quad 3x + y - 4 = 0, \quad x + 3y - 4 = 0$

○ A: Isoceles
○ B: Equlateral
○ C: Right angled
○ D: None of the above.

4. **Pair of lines represented by the equation $2x^2 + 8xy + 8y^2$ are?**

○ A: Real and distinct.
○ B: Real and coincident.
○ C: Imginary.
○ D: None of the above.

5. **What is the value of h such that points (-1,h) , (3,2) and (7,3) are collinear?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. **The lines px + qy + r = 0, qx + ry + p = 0, rx + py + q = 0 are concurrent if?**

○ A: $p + q + r = 0$
○ B: $p^2 + q^2 + r^2 + pq + qr + rp = 0$
○ C: $p^2 + q^2 + r^2 + 3pqr = 0$
○ D: All of the above.

7. **The equation of base of an equilateral triangle is x + y = 2 and the vertex opposite to this base is (2, − 1). Then the length of the side of triangle equals?**

○ A: $\sqrt{3}$
○ B: $\sqrt{1} / \sqrt{3}$
○ C: $\sqrt{2} / \sqrt{3}$
○ D: $\sqrt{3} / \sqrt{2}$

8. **For a pair of Imaginary lines represented by the equation $ax^2 + 2hxy + by^2$. Which of the following is true?**

○ A: The imaginary lines never intersect.
○ B: They intersect at (0,0)
○ C: They intersect at postivie y axis.
○ D: They intersect at negative y axis.

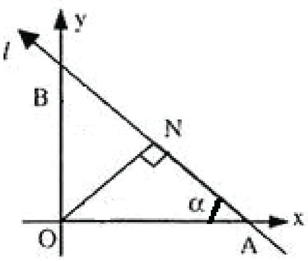
9. **If vertices of triangle ABC are A(2,2), B(-4,-4) and C(5,-8). Then the length of median through C is?**

○ A: $\sqrt{65}$
○ B: $\sqrt{75}$
○ C: $\sqrt{85}$
○ D: $\sqrt{95}$

10. **For a pair of lines represented by the equation $3x^2 + 4xy + 9y^2$, the lines are?**

○ A: Real and distinct.
○ B: Real and coincident.
○ C: Imaginary.
○ D: Not passing through the origin.

11. What the equation of a line at a distance 5 units from the origin, having angle $\alpha = 30^o$ as shown in the figure below?



○ A: $\sqrt{3}x + y = 10$ ○ B: $x + \sqrt{3}y = 10$

○ C: $\sqrt{3}x + y = 5$ ○ D: $x + \sqrt{3}y = 5$

12. Which of the following is true about the two points (0,0) and (-4,7) with respect to the line $2x - 3y + 6 = 0$?

○ A: They both lie on the line. ○ B: They both lie above the line.

○ C: They both lie below the line. ○ D: They lie on the opposite sides of the line.

13. What is the radius of circle inscribed in the triangle formed by lines $x = 0$, $y = 0$ and $4x + 3y - 24 = 0$?

○ A: 2 ○ B: $2\sqrt{2}$

○ C: 3 ○ D: 4

14. Equation of the right bisector of the line segment joining points (7,4) and (-1,-2) is?

○ A: $4x + 3y - 10 = 0$ ○ B: $4x + 3y - 15 = 0$

○ C: $3x - 4y + 7 = 0$ ○ D: $3x - 4y - 7 = 0$

15. The line segment joining the point (-3,-4) and (1,-2) is divided by the y axis in ratio?

○ A: 1:1 ○ B: 2:1

○ C: 3:1 ○ D: 4:1

16. If the coordinates of the mid point of the triangle are (1,-1), (2,3) and (3,2) then the area of triangle is?

○ A: 3/2 ○ B: 9/2

○ C: 6 ○ D: 11/2

17. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form which of the following triangles?

○ A: Isoceles ○ B: Equilateral

○ C: Right Angled ○ D: None of the above.

18. **Points A(1, 3) and C(5, 1) are opposite vertices of a rectangle ABCD. If the slope of BD is 2, then its equation is**

○ A: $2x - y = 4$ ○ B: $2x + y = 4$

○ C: $2x + y = 7$ ○ D: $2x - y = -7$

19. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product then c has the value?

○ A: -1 ○ B: 1

○ C: -2 ○ D: 2

20. Equation of the line passing through the point (1,-2) and cutting off equal intercepts from the axis would be?

○ A: $x + y = 1$ ○ B: $x + y + 1 = 0$

○ C: $x - y = 1$ ○ D: $x - y + 1 = 0$

TEST 4

1. For a pair of lines represented by the equation $ax^2 + 2hxy + by^2$, which of the following is true if the lines are parallel?

○ A: $h^2 = 0$ ○ B: $h^2 > ab$

○ C: $h^2 < ab$ ○ D: $h^2 - ab = 0$

2. If point A (-1,2) is the center of a circle and point B (7,5) lies on the circle. The diameter of circle is?

○ A: 9 ○ B: $\sqrt{45}$.

○ C: $\sqrt{73}$. ○ D: $2\sqrt{73}$

3. The coordinate axis is changed through the point O' (2,3). If coordinates of a point P in new axis are (-1,4) then the original coordinates of P were?

○ A: (0,0) ○ B: (2,3)

○ C: (1,7) ○ D: (3,-1)

4. The point P (x,y) with $x<0$ and $y<0$ lies in which quadrant?

○ A: Quadrant I ○ B: Quadrant II

○ C: Quadrant III ○ D: Quadrant IV

5. What are the new coordinates of the point P(5,3), if the axis is rotated by angle 45°?

○ A: (4,2) ○ B: $(\sqrt{2}, 2\sqrt{2})$

○ C: $(2\sqrt{2}, -\sqrt{2})$ ○ D: $(4\sqrt{2}, -\sqrt{2})$

6. Inclination of the line $y = -x$ is?

○ A: 45° ○ B: 135°

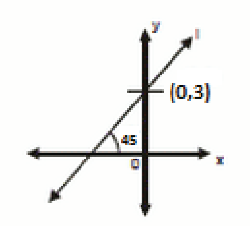
○ C: 225° ○ D: 315°

7. What is the angle between the lines L_1 joining points (1,-7) and (6,-4) and L_2 joining points (-1,2) and (-6,-1)?

○ A: 0 ○ B: 30

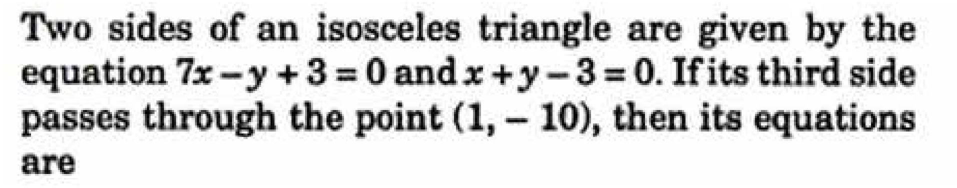
○ C: 45 ○ D: 60

8. The equation of the line given below is?



○ A: $y = 3x - 1$ ○ B: $y = 3x + 1$

○ C: $y + x = 3$ ○ D: $y = x + 3$

9. 

Two sides of an isosceles triangle are given by the equation $7x - y + 3 = 0$ and $x + y - 3 = 0$. If its third side passes through the point (1, – 10), then its equations are

○ A: $x - 3y - 31 = 0$ or $3x + y + 7 = 0$ ○ B: $x - y - 31 = 0$ or $x + y + 7 = 0$

○ C: $2x - 3y - 11 = 0$ or $x + 4y + 9 = 0$ ○ D: $x + y + 1 = 0$ or $5x - y + 10 = 0$

10. Equation of the line through the point (2,3) and perpendicular to the line joining (-5,6) and (-6,5) is given by?

○ A: $x - y + 5 = 0$ ○ B: $x + y + 5 = 0$

○ C: $x - y - 5 = 0$ ○ D: $x + y - 5 = 0$

11. The extremities of diagonal of a parallelogram are the points (3, − 4) and (− 6, 5). If the third vertex is (− 2, 1), then the fourth vertex will be?

○ A: (0,1) ○ B: (1,0)

○ C: (1,1) ○ D: (-1,0)

12. Orthocenter of a triangle is defined as the point of intersection of?

○ A: Altitudes ○ B: Angle bisectors

○ C: Medians ○ D: None of the above.

13. If the lines represented by equation $Ax^2 + 2Hxy + By^2 = 0$ are perpendicular, then?

○ A: $A + H = 0$ ○ B: $A + B = 0$

○ C: $H = 0$ ○ D: $A/B = H/B$

14. What is the equation of the lines passing through the point (-5,-3) and (9,-1) ?

○ A: $x - 7y - 16 = 0$ ○ B: $x - 7y + 16 = 0$

○ C: $x + 7y + 16 = 0$ ○ D: $x + 7y - 20 = 0$

15. The diagonals of a parallelogram PQRS are along the lines $x + 3y = 4$ and $6x – 2y = 7$. Then PQRS must be a?

○ A: General parallelogram ○ B: Rectangle

○ C: Rhombus ○ D: None of the above.

16. A line passes through point (4, 1) and is perpendicular to line $3x + y = 3$, then its x − intercept is?

○ A: ½ ○ B: 2/3

○ C: 1 ○ D: 3/2

17. The line passing through point (1,2) and perpendicular to $x + y + 1 = 0$ is?

○ A: $y - x + 1 = 0$ ○ B: $y - x - 1 = 0$

○ C: $y - x + 2 = 0$ ○ D: $y - x - 2 = 0$

18. Distance between two lines defined by $x + 3 = 0$ and $x - 3 = 0$ is?

○ A: 0 ○ B: 3

○ C: 6 ○ D: 9

19. M is the midpoint of line AB. The coordinates of A are (-2,3) and the coordinates of M are (1,0). The coordinates of B are?

○ A: (-1/2,3/2)
○ B: (4,-3)
○ C: (4,6)
○ D: (-4,-3)

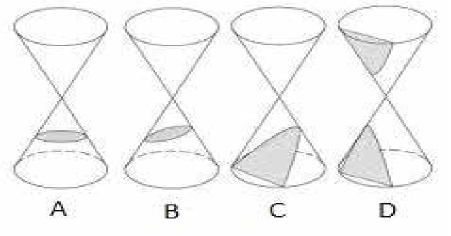
20. If a line passing through the points (x_1 , y_1) and (x_2 , y_2) such that $x_1 = x_2$ then the slope of the line is?

○ A: Zero
○ B: Positive
○ C: Negative
○ D: Undefined

Conic Sections

TEST 1

1. **Which of the following cutting of a cone represents a circle?**



○ A: A
○ B: B
○ C: C
○ D: D

2. **Eccentricity of ellipse is?**

○ A: Equal to 1.
○ B: Greater than zero and less than 1.
○ C: Greater than one.
○ D: Zero

3. **Center and radius of the circle represented by $x^2 + y^2 = 9$ is?**

○ A: (1,1) and 9
○ B: (1,1) and 3
○ C: (0,0) and 9
○ D: (0,0) and 3

4. **Equation of a circle cannot have a term?**

○ A: x
○ B: y
○ C: xy
○ D: All of the above.

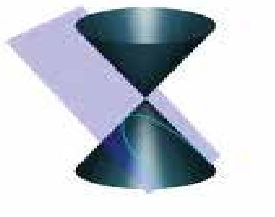
5. **The center of the circle represented by the equation $(x - 3)^2 + (y + 4)^2 = 4$ is?**

○ A: (3,4)
○ B: (-3,-4)
○ C: (-3,4)
○ D: (3,-4)

6. **What is the focus of the ellipse $x^2/16 + y^2/4 = 1$?**

○ A: $(\pm 2\sqrt{3}, 0)$
○ B: $(\pm \sqrt{3}, 0)$.
○ C: $(\pm 2\sqrt{5}, 0)$.
○ D: $(\pm \sqrt{5}, 0)$.

7. **The plane cutting a double cone as shown in the figure below would get a/an?**

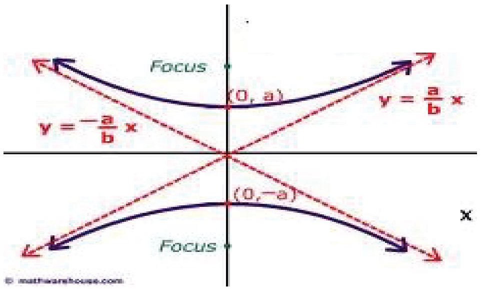


○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

8. **The equation $x^2/a^2 + y^2/b^2 = 1$ represents a verticle ellipse if?**

○ A: $a^2 = b^2$
○ B: $a^2 < b^2$
○ C: $a^2 > b^2$
○ D: None of the above.

9. The equation of the given hyperbola is of form?



○ A: $x^2/a^2 + y^2/b^2 = 1$ ○ B: $x^2/b^2 + y^2/a^2 = 1$

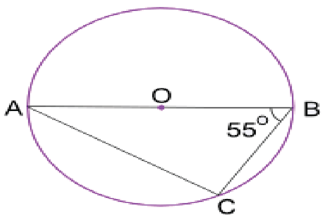
○ C: $x^2/a^2 - y^2/b^2 = 1$ ○ D: $y^2/a^2 - x^2/b^2 = 1$

10. When the cutting of a conic section is parallel to the axis of the cone and intersects both nappes, it represents a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

11. What is angle CAB in the given figure?



○ A: 35° ○ B: 45°

○ C: 55° ○ D: 65°

12. A line $y = mx + c$ intersects a circle $x^2 + y^2 = a^2$. The point of intersection are imaginary if?

○ A: $a^2 (1+m^2) - c^2 > 0$ ○ B: $a^2 (1+m^2) - c^2 = 0$

○ C: $a^2 (1+m^2) - c^2 < 0$ ○ D: Intersection points are never imaginary.

13. If a circle is represented by the equation $x^2 + y^2 + 4x - 6y - 12 = 0$. Then the point (-5,6) is?

○ A: Inside the circle ○ B: Outside the circle.

○ C: On the circle. ○ D: Center of the circle.

14. Circle is a special case of ellipse with eccentricity = ?

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

15. The parametric form of equation ($a \cos \Theta$, $b \sin \Theta$) is for?

○ A: Circle ○ B: Hyperbola

○ C: Ellipse ○ D: Parabola

16. Equation of the directrices of hyperbola $y^2/a^2 - x^2/b^2 = 1$ is given by?

○ A: $x = \pm c/e^2$ ○ B: $x = \pm b/e$

○ C: $y = \pm c/e^2$ ○ D: $y = \pm b/e$

17. If $e > 1$ then the conic section is a?

○ A: Parabols ○ B: Ellipse

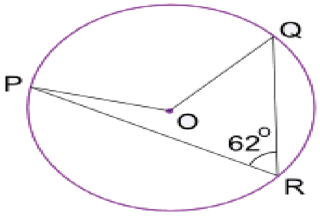
○ C: Hyperbola ○ D: Circle.

18. If a plane cutting one section of a double cone is slightly tilted and not parallel to the generator of the cone, we get a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

19. What is the angle POQ in the given diagram?



○ A: 62° ○ B: 102°

○ C: 124° ○ D: 132°

20. Focal chord perpendicular to the axis of the parabola is called?

○ A: Directrix. ○ B: Tangent Chord

○ C: Latusrectum. ○ D: Vertex.

TEST 2

1. **For a general form of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius is given by**?

○ A: $g + f + c$ ○ B: $\sqrt{g^2 + f^2}$

○ C: $\sqrt{g^2 + f^2 - c}$ ○ D: $\sqrt{g^2 + f^2 + c}$

What is the eccentricity of the ellipse given by equation $x^2/9 + y^2/4 = 1$?

○ A: 5/3 ○ B: √5/3

○ C: 2/3 ○ D: √2/3

2. **The equations $x = at^2$, $y = at$; $t \in R$ represents?**

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

3. **Intersecting properties of conic sections were discovered by?**

○ A: Pythagoras ○ B: Eudoxus and Georg Cantor

○ C: Euclid ○ D: Apollonius and Pappus

4. **What are the coordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$?**

○ A: (2,-1) ○ B: (2,1)

○ C: (-2,-1) ○ D: (2,0)

5. **What is the focus of the parabola $4x - y^2 = 2y + 13$?**

○ A: (3,-1) ○ B: (3,1)

○ C: (4, 1) ○ D: (4, -1)

6. What are the foci of hyperbola $x^2/9 - y^2/4 = 1$?

○ A: $(\pm\sqrt{5}, 0)$ ○ B: $(0, \pm\sqrt{5})$

○ C: $(0, \pm\sqrt{13})$ ○ D: $(\pm\sqrt{13}, 0)$

7. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x-a)$ is?

○ A: 90° ○ B: 60°

○ C: 45° ○ D: 30°

8. Equation of a line tangent to ellipse at $x^2/a^2 + y^2/b^2 = 1$ at points (4,10) is?

○ A: $4x/a^2 + 10y/b^2 = 1$ ○ B: $10x/a^2 + 4y/b^2 = 1$

○ C: $16x/a^2 + 100y/b^2 = 1$ ○ D: $100x/a^2 + 16y/b^2 = 1$

9. The line $y = 2x + c$ is tangent to the ellipse $x^2/16 + y^2/4 = 1$ if c equals?

○ A: $\sqrt{29}$ ○ B: $\sqrt{60}$

○ C: $\sqrt{68}$ ○ D: $\sqrt{74}$

10. What is the center of the ellipse $x^2 + 4y^2 + 4x - 24y + 24 = 0$?

○ A: (-2,3) ○ B: (-2, -3)

○ C: (2,3) ○ D: (2,-3)

11. Which of the following is not an equation of a circle?

○ A: $x^2 + y^2 - x + 98y + 11 = 4$ ○ B: $x^2 + y^2 + 18x + 98y + 11 = 0$

○ C: $5x^2 + 5y^2 + 14x + 12y - 10 = 0$ ○ D: $x^2 + 3y^2 + 10x - 9y + 11 = 0$

12. Latusrectum of the parabola $y^2 = -4ax$ is?

○ A: $x = a$ ○ B: $x = -a$

○ C: $y = a$ ○ D: $y = -a$

13. The equations $x = a \cos \theta$, $y = b \sin \theta$, $0 \leq \theta < 2\pi$, $a \neq b$, represents?

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

14. The vertex of the parabola $(y - a)^2 = 4a (x - a)$ is?

○ A: (0,a) ○ B: (a,0)

○ C: (0,0) ○ D: None of the above.

15. A second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola if?

○ A: $h^2 - ab = 0$ ○ B: $h^2 - ab > 0$

○ C: $h^2 - ab < 0$ ○ D: None of the above.

16. What is the length of the major axis for the ellipse $x^2/16 + y^2/4 = 1$?

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

17. The equation $y = mx + a/m$ is tangent to $y^2 = 4ax$ for m = ?

○ A: 0 ○ B: 1

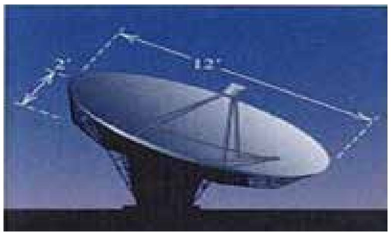
○ C: All positive values ○ D: All nonzero values

18. What is the center of a circle represented by a general form $5x^2 + 5y^2 + 24x + 36y + 10 = 0$?

○ A: (-12/5 , -18/5) ○ B: (12/5 , 18/5)

○ C: (-9/5 , -7/5) ○ D: (9/5 , 7/5)

19. The interior of a satellite dish has diameter 12 ft and 2 ft deep as shown in the figure below. What is the distance from the center of the dish to the focus?



○ A: 4.5 ft ○ B: 5.5 ft
○ C: 6.0 ft. ○ D: 6.2 ft

TEST 3

1. Minimum number of non-collinear points on a circle required to form an equation of a circle are?

○ A: 2 ○ B: 3
○ C: 4 ○ D: 5

2. The foci of an ellipse are $(0, \pm 1)$ and minor axis is of unit length. The equation of the ellipse is ?

○ A: $2x^2 + 4y^2 = 5$ ○ B: $4x^2 + 2y^2 = 5$
○ C: $15x^2 + 6y^2 = 1$ ○ D: $20x^2 + 4y^2 = 5$

3. The sum of distances of any point on the ellipse $3x^2 + 4y^2 = 24$ from its foci is?

○ A: 8 units ○ B: $2\sqrt{2}$ units
○ C: $4\sqrt{2}$ units ○ D: 7 units

4. The line $y + 2x - 5 = 0$ with respect to the circle $x^2 + y^2 + 2x - 9 = 0$?

○ A: Cuts the circle at two distinct points.
○ B: Tangent to the circle. ○ C: Do not touch the circle.
○ D: None of the above.

5. If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then a is equal to?

○ A: 15/16 ○ B: 9/7
○ C: 5/4 ○ D: 2/3

6. What is the equation of tangent to the circle $x^2 + y^2 + 5/3\,x - 13/3\,y + 2/3 = 0$ at $(1, 10/3)$?

○ A: $21x - 33y + 89 = 0$ ○ B: $33x + 21y + 157 = 0$
○ C: $8x + 46y - 22 = 0$ ○ D: $3x + 19y + 27 = 0$

7. What is the equation of a circle with diameter between two points A (2,3) and B (4,6)?

○ A: $x^2 + y^2 + 3x - 9y - 23 = 0$ ○ B: $x^2 + y^2 - 9x - 2y + 11 = 0$
○ C: $x^2 + y^2 - 6x - 9y + 26 = 0$ ○ D: Cannot be determined from the given information.

8. If e_1 and e_2 are eccentricities of the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$ and $x^2/b^2 - y^2/a^2 = 1$ then?

○ A: $e_1 = e_2$ ○ B: $e_1 * e_2 = 1$
○ C: $e_1 + e_2 = 0$ ○ D: $1/e_1^2 + 1/e_2^2 = 1$

9. The line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$ if c equals?

○ A: 2 ○ B: 1/2
○ C: 0 ○ D: -1/2

10. The equation of the circle whose diameter is the latusrectum of the parabola $x^2 = 4y$ is?

○ A: $x^2 + (y-1)^2 = 4$
○ B: $(x - 2)^2 + (y - 1)^2 = 4$
○ C: $y^2 + (x-1)^2 = 4$
○ D: $y^2 + (x-1)^2 = 2$

11. Line $y = 2c$ is a tangent to the parabola $y^2 = 4ax$ if c is equal to?

○ A: 0
○ B: 4
○ C: 2a
○ D: None of the above.

12. The line $5y + 12x - 39 = 0$ to the circle $x^2 + y^2 = 9$?

○ A: Cuts the circle in two distinct points.
○ B: Do not touch the circle
○ C: Is tangent to circle
○ D: Cuts the circle at two imaginary points

13. What is the equation of a circle passing through non collinear points A(5, 8) and B(-2,9)?

○ A: $x^2 + y^2 + 4x - 12y - 20 = 0$
○ B: $x^2 + y^2 + 4x - 9y - 15 = 0$
○ C: $x^2 + y^2 + 9x - 7y + 3 = 0$
○ D: Equation cannot be formed from the given information.

14. What is the focus of the ellipse given by the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$?

○ A: $(1, \pm\sqrt{5})$
○ B: $(1,-1\pm\sqrt{5})$
○ C: $(1,1\pm\sqrt{5})$
○ D: $(1\pm\sqrt{5}, -1)$

15. $x = \dfrac{e^t + e^{-t}}{2}$, $y = \dfrac{e^t - e^{-t}}{2}$; $t \in R$ represents

○ A: A circle
○ B: A parabola
○ C: A hyperbola
○ D: An ellipse

16. The line $y = mx + 1$ is tangent to parabola $y^2 = 4x$ if m = ?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

17. Slope of the normal at point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is?

○ A: 1/t
○ B: t
○ C: -t
○ D: -1/t

18. What is the equation of the asymptotes for the given hyperbola?

$4x^2 - 9y^2 - 32x - 18y + 19 = 0$.

○ A: $(y + 1) = \pm 2/3\ (x - 4)$
○ B: $(y + 1) = \pm 4/9\ (x - 4)$
○ C: $(y - 1) = \pm 2/3\ (x + 4)$
○ D: $(y - 1) = \pm 4/9\ (x + 4)$

19. The general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a hyperbola if?

○ A: $h^2 - ab < 0$
○ B: $h^2 - ab = 0$
○ C: $h^2 - ab > 0$
○ D: None of the above.

20. The point on the curve $y^2 = x$, where the tangent line makes an angle of 45° with the x-axis is?

○ A: (3/4,1/2)
○ B: (1/4,1/2)
○ C: (1/4,3/2)
○ D: (1,2)

TEST 4

1. **Parametric form of equation for a cricle is?**

○ A: (a sec Θ, b tan Θ) ○ B: (r cos Θ, r sin Θ)

○ C: (a cos Θ, b sin Θ) ○ D: $(at^2 , 2at)$

2. **What is the vertex of the parabola $y = -2x^2 + 4x + 1$?**

○ A: (2,1) ○ B: (-2,-1)

○ C: (-1,-3) ○ D: (1,3)

3. **If one foci of the ellipse is at (-3,0) and the ellipse is centered around the origin. What is the distance between the two foci of the ellipse?**

○ A: Cannot be determined. ○ B: 9

○ C: 6 ○ D: 3

4. **What is the focus of the parabola $y^2 - x - 2y + 2 = 0$?**

○ A: (3/4 , 1) ○ B: (1/4 , 0)

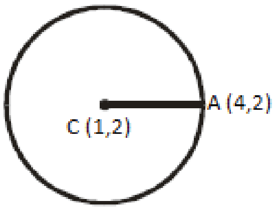
○ C: (1/4 , 1) ○ D: (5/4 , 1)

5. **Axis of the parabola $9y^2 -16x -12y - 57 = 0$ is?**

○ A: 2/3 ○ B: 3/2

○ C: -2/3 ○ D: -3/2

6. **What is the equation of the circle given in the figure below?**



○ A: $(x - 1)^2 + (y - 2)^2 = 16$ ○ B: $(x + 1)^2 + (y + 2)^2 = 9$

○ C: $(x - 1)^2 + (y - 2)^2 = 9$ ○ D: $(x - 1)^2 + (y + 2)^2 = 16$

7. **Parametric form of equation for a parabola is?**

○ A: (r cos Θ, r sin Θ) ○ B: $(at^2 , 2at)$

○ C: (a cos Θ, b sin Θ) ○ D: (a sec Θ, b tan Θ)

8. **The equation of the parabola with focus at (0, a) and directrix $y + a = 0$ is ($a > 0$) ?**

○ A: $x^2 = 4ay$ ○ B: $x^2 = -4ay$

○ C: $y^2 = 4ax$ ○ D: $y^2 = -4ax$

9. **The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is?**

○ A: (4,4) ○ B: (2,2)

○ C: (√2, 2) ○ D: (2√2, 2)

10. **For a general equation $Ax^2 + By^2 + Gx + Fy + C = 0$, if A is not equal to B and both have opposite signs then it represents?**

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

11. The line $y = mx + c$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ if?

○ A: $c = a/m$
○ B: $c^2 = a^2 m^2 + b^2$
○ C: $c^2 = a^2 m^2 - b^2$
○ D: None of the above.

12. If a is the major axis, b is the minor axis and e is the eccentricity of an ellipse. Its directrices are given by?

○ A: $\pm c/e$
○ B: $\pm b/e$
○ C: $\pm a/e$
○ D: $\pm b/e^2$

13. The equation $(y - y_1)(x_1 + g) = (x - x_1)(y_1 + f)$ represents?

○ A: Tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ B: Normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ C: Chord of a circle $x^2 + y^2 + 2gx + 2fy + c = 0$ through point (x_1 , y_1)
○ D: None of the above.

14. If the length of major axis of ellipse is 2a and length of minor axis is 2b. Then the length if latusrectum is approximately?

○ A: $4b/a$
○ B: $4a^2/b$
○ C: $2b^2/a$
○ D: $a/2b$

15. When the cutting of a conic section is perpendicular to the axis of the cone, it represents a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

16. What is the length of the tangent from point (-5, 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$?

○ A: $\sqrt{29}$
○ B: $\sqrt{67}$
○ C: $\sqrt{102}$
○ D: $\sqrt{133}$

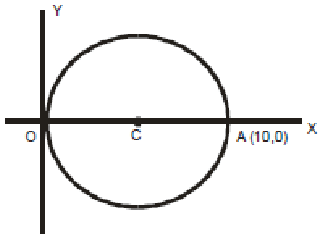
17. From a point P outside a circle, how many tangents can be drawn?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

18. What is the radius of a circle represented by the equation $x^2 + y^2+12x - 10y = 0$?

○ A: $\sqrt{61}$
○ B: $\sqrt{55}$
○ C: $\sqrt{52}$
○ D: $\sqrt{47}$

19. Equation of the circle given in the figure below is?



○ A: $x^2 + y^2 = 25$
○ B: $(x-5)^2 + y^2 = 25$
○ C: $(x + 5)^2 + y^2 = 25$
○ D: $(x + 5)^2 + y^2 = 10$

20. Find the equation of an ellipse with centre (0,0), focus (0,-3) and one vertes at (0,4)?

○ A: $x^2/16 + y^2/7 = 1$
○ B: $x^2/7 + y^2/16 = 1$
○ C: $x^2/\sqrt{7} + y^2/4 = 1$
○ D: $x^2/7 + y^2/4 = 1$

Vectors

TEST 1

1. **What are the direction cosines of unit vector**

$$\hat{\underline{v}} = \left[\frac{6}{\sqrt{41}}, \frac{-2}{\sqrt{41}}, \frac{1}{\sqrt{41}}\right]$$

○ A: 0, 0, 0
○ B: -6/√41 , +2/√41, -1/√41
○ C: 6/√41 , -2/√41, 1/√41
○ D: None of the above.

2. **If volume of a parallelepiped with a ,b , c as co-terminus edges is 36 the volume of the tetrahedron with the same edges is?**

○ A: 13
○ B: 12
○ C: 6
○ D: 3

3. **Value of [i, i , k] is?**

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

4. **The value of 2*i* x 4*k* =?**

○ A: 0
○ B: 8k
○ C: -8j
○ D: 8j

5. **The volume of the parallelepiped with *u* , *v* and *w* as its coterminus edges is?**

○ A: u.(v x w)
○ B: 1/2 * u.(v x w)
○ C: 1/6 * u.(v x w)
○ D: u x (v x w)

6. **If ā is a unit vector. Then the value of ā.ƃ is? Assume that the two vectos are not perpendicular to each other.**

○ A: 0
○ B: 1
○ C: ā cos θ
○ D: ƃ cos θ

7. **Which of the following statement is true?**

○ A: Only dot product possesses distributive property
○ B: Only cross product possesses distributive property
○ C: Both dot and cross product possess distributive property
○ D: Neither dot nor cross product possess distributive property

8. **The value of (2*j x i*) - 3*k* = ?**

○ A: -5k
○ B: 5k
○ C: k
○ D: -k

9. **Find the magnitude of vector v = -3i + 4j ?**

○ A: 2
○ B: 3
○ C: 4
○ D: 5

10. **If terminal point of a vector coincides with its origin point then it is called?**

○ A: Unit Vector.
○ B: Null Vector.
○ C: Equity Vector.
○ D: Negative Vector.

11. If ā = [1,-3] and б = [2,5] ; 4ā + 2б = ?

○ A: [3,2]
○ B: [8,2]
○ C: [-8,2]
○ D: [8,-2]

12. If ā, б and c are three vectors representing three edges of a parallelepiped. Its volume is given by?

○ A: ā x б x c
○ B: ā . б . c
○ C: ā . (б x c) / 2
○ D: ā . (б x c)

13. If three vectors are coplanar then their scalar triple product is?

○ A: 0
○ B: 1
○ C: -1
○ D: Equal to vector triple product.

14. i.j = ?

○ A: 0
○ B: 1
○ C: -1
○ D: k

15. If ā = i - k and б = j + k then the projection of ā along б is?

○ A: -1/√2
○ B: 1/√2
○ C: 1
○ D: -1

16. If k is a scalar ā x kб = ?

○ A: kā x б
○ B: k (ā x б)
○ C: kā x kб
○ D: Both A and B.

17. If ā = [2,1,3] and б = [-1,4,0]. What is the magnitude of ā - 2б?

○ A: 16
○ B: √74
○ C: √93
○ D: 36

18. What is the unit vector for v = 3i - j +2k?

○ A: [3/√14 , 1/√14, 2/√14]
○ B: [5/√37 , -2/√37, 7/√37]
○ C: [1/√37 , 8/√37, -3/√37]
○ D: [3/√14 , -1/√14, 2/√14]

19. The position vector of a point P(x, y, z) is denoted by?

○ A: $\overrightarrow{PQ}$
○ B: $\overrightarrow{P}$
○ C: $\overrightarrow{OP}$
○ D: All of the above.

20. k.k =?

○ A: 0
○ B: 1
○ C: -1
○ D: j

TEST 2

1. **If AB = i + j + k, AC = -4k and AD = i +2j - 8k then the volume of tetrahedron ABCD formed by the three vectors is?**

○ A: 1 ○ B: 2/3

○ C: 2 ○ D: 4

2. **What is the value of α such that αi + j , i + j + 3k and 2i + j - 2k are coplanar?**

○ A: 1/3 ○ B: 7/4

○ C: 9/5 ○ D: 8/5

3. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors such that $|\vec{b}| = |\vec{c}|$, then $\left[(\vec{a}+\vec{b}) \times (\vec{a}+\vec{c})\right] \times (\vec{b} \times \vec{c}) =$

○ A: 1 ○ B: -1

○ C: 0 ○ D: 2

4. **(2j x 3i).k = ?**

○ A: 0 ○ B: 7

○ C: 6 ○ D: -6

5. **What is the vector perpendicular to both vectors ā = 2i - j + k and ƃ = 4i + 2j - k?**

○ A: -i + 6j + 8k ○ B: -2i + 3j + 9k

○ C: 3i + 1j + 7k ○ D: 5i - 3j + k

6. **If ā = 2i - 4j + 5k and ƃ = 4i + xj - 4k. What is the value of x if ā and ƃ are perpendicular to each other?**

○ A: -1 ○ B: -2

○ C: -3 ○ D: -4

7. **Which of these vectors are parallel?**

a = 2i + 3j + k, b = 4i + 6j + 2k, c = 6i + 9j + 3k

○ A: a and b ○ B: a and c

○ C: a, b and c all are parallel to each other.

○ D: None of them is parallel.

8. **Unit vector perpendicular to i - j and i + j is?**

○ A: k ○ B: -k

○ C: (i - j) / 2 ○ D: (i + j) / √2

9. **Which of the following expressions is meaningful?**

○ A: u.(v x w) ○ B: (u.v) .w

○ C: (u.v) . w ○ D: None of the above.

10. **Zero vector is?**

○ A: Parallel to every vector. ○ B: Perpendicular to every vector.

○ C: Both parallel and perpendicular to every vector.

○ D: Is inverse of every vector.

TEST 3

1. **The point which divides the line joining (2, 4, 5) and (-3, 5, - 4) in the ratio 2 : 3, lies on?**

○ A: XY plane　○ B: YZ plane

○ C: XZ plane　○ D: None of the above.

2. **If result of two forces ā of magnitude (P) and б of magnitude (Q) isperpendicular to ā and has magnitude P. Then the magnitude of б is?**

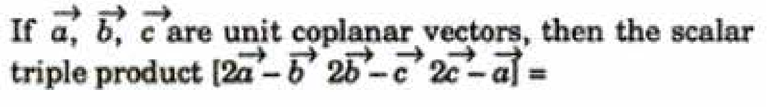
○ A: P　○ B: P√2

○ C: P√3　○ D: 2P√3

3. **If ā x б = ā x ē then which of the following is true?**

○ A: ā, б and ē are coplanar.　○ B: ā, б and ē are orthogonal

○ C: б = ē　○ D: ā is parallel to б

4. 

If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}\ \ 2\vec{b}-\vec{c}\ \ 2\vec{c}-\vec{a}] =$

○ A: 0　○ B: 1

○ C: √2　○ D: √3

5. **If ā, б, ē, ō are the vertices of a square then?**

○ A: б - ā = ē – б　○ B: ā + б + ē = 0

○ C: (ē - ā) . (ō - б) = 0　○ D: None of the above.

6. **If the vectors a, b and c be the vectors representing the sides AB, BC and CA respectively of a triangle ABC, then?**

○ A: a.(bxc) = 0　○ B: (a.b) x c = (a.c) x b

○ C: |a x b| = |a x c| = |b x c|　○ D: |a x b| + |b x c| + |c x a| = 0

Position vector a = 2i - 3j and b = 3i + 2j. What are the coordinates of position vector that divides the line between a and b in ration 4:3?

○ A: 11/7 i + 8/7 j　○ B: 1/7 i - 5/7 j

○ C: 18/7 i - 1/7 j　○ D: 23/7 i + 3/7 j

7. **The points (5, 2, 4), (6, −1, 2) and (8, −7, k) are collinear if k is equal to?**

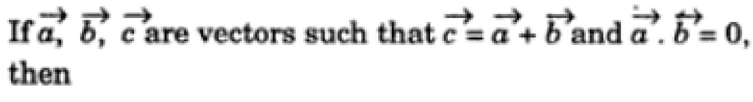
○ A: 3　○ B: 2

○ C: -1　○ D: -2

8. **If A (-2,-3), B (1,4), C(0,-5) are three vertices of parallelogram ABCD. What are the coordinates of D if AB is parallel to DC?**

○ A: (3,14)　○ B: (-4,11)

○ C: (-3, -12)　○ D: (-4, 9)

9. 

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{c}=\vec{a}+\vec{b}$ and $\vec{a}\cdot\vec{b}=0$, then

○ A: $a^2 + b^2 + c^2 = 0$　○ B: $a^2 - b^2 = c^2$

○ C: $a^2 + b^2 = 0$　○ D: $c^2 = a^2 + b^2$

10. **The point having position vectors $2\hat i + 3\hat j + 4\hat k$, $3\hat i + 4\hat j + 2\hat k$, $4\hat i + 2\hat j + 3\hat k$ are the vertices of a triangle. The triangle is?**

○ A: Right angled.
○ B: Equilateral.
○ C: Isosceles.
○ D: None of the above.

11. **The points with position vectors $14\hat i - 13\hat j$, $12\hat i - 5\hat j$ and $a\hat i + 11\hat j$ are collinear if a equals**

○ A: 8
○ B: 13
○ C: -5
○ D: -9

12. Angles α , β and δ are direction angles of a single vector only if?

○ A: $\cos^2 \alpha = \cos^2 \beta = \cos^2 \delta$
○ B: $\cos^2 \alpha = \cos^2 \beta + \cos^2 \delta$
○ C: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 0$
○ D: $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta = 1$

13. **Let $\vec a = \hat i - \hat k$, $\vec b = x\hat i + \hat j + (1-x)\hat k$ and $\vec c = y\hat i + x\hat j + (1+x-y)\hat k$, then $[\vec a\ \vec b\ \vec c]$ depends on**

○ A: Only x
○ B: Only y
○ C: Both x and y
○ D: Neither x nor y

TEST 4

1. Unit vector in the direction of vector v = [-3,-4] is?

○ A: -3/5 i - 4/5 j
○ B: -3/5 i + 4/5 j
○ C: 3/5 i - 4/5 j
○ D: 3/5 i + 4/5 j

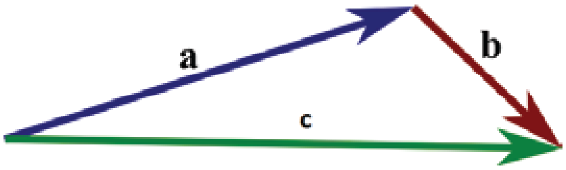
2. Let a = 2i + j + k, a vector c perpendicular to a is?

○ A: $\frac{1}{\sqrt{2}}(-j+k)$
○ B: $\frac{1}{\sqrt{3}}(i+j-k)$
○ C: $\frac{1}{\sqrt{5}}(-i-j-k)$
○ D: $\frac{1}{\sqrt{2}}(i-2j)$

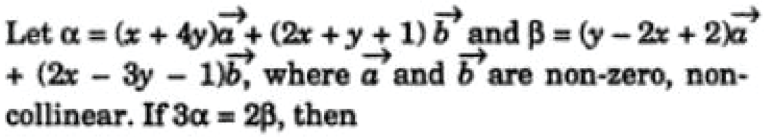
3. **The area (in square units) of the parallelogram whose diagonals are $\vec a = \hat i + \hat j - 2\hat k$ and $\vec b = \hat i - 3\hat j + 4\hat k$**

○ A: √7
○ B: √11
○ C: √14
○ D: Cannot be determined from the given information.

4. In the figure below vector b is given by?



○ A: c + a
○ B: c - a
○ C: a – c
○ D: None of the above.

5. 
Let α = (x + 4y)$\vec{a}$ + (2x + y + 1)$\vec{b}$ and β = (y − 2x + 2)$\vec{a}$ + (2x − 3y − 1)$\vec{b}$, where $\vec{a}$ and $\vec{b}$ are non-zero, non-collinear. If 3α = 2β, then

○ A: x= 1, y = -2
○ B: x= -2, y = -1
○ C: x= 2, y = 2
○ D: x= 2, y = -1

6. For two position vectors ā and ƃ. The coordinates of position vector dividing the line between ā and ƃ in ration 1 : 1 would be?

○ A: (ā - ƃ) / 2
○ B: (ā + ƃ) / 2
○ C: (ā + ƃ) / 4
○ D: (ā - ƃ) / 4

7. If magnitude of vector ā = 25 the ā.ā = ?

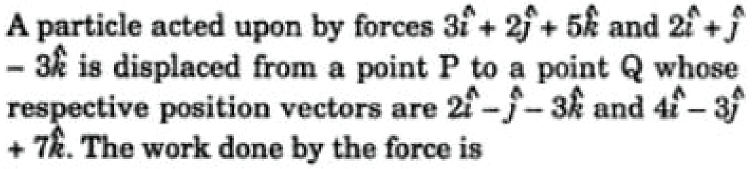
○ A: 5
○ B: 25
○ C: 625
○ D: 0

8. Which of the following is not a defined quantity?

○ A: i.i / k.k
○ B: i.j / j.j
○ C: i.i / i.k
○ D: All of them are defined quantities.

9. If ā.i = 0 and ā.j = 0 and ā.k = 0 then value of ā is?

○ A: i + j + k
○ B: [-1,-1,-1]
○ C: Unit vector.
○ D: Null vector.

10. 
A particle acted upon by forces $3\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}$ is displaced from a point P to a point Q whose respective position vectors are $2\hat{i} - \hat{j} - 3\hat{k}$ and $4\hat{i} - 3\hat{j} + 7\hat{k}$. The work done by the force is

○ A: 16
○ B: 24
○ C: 36
○ D: 38

11. Value of [k, i, j] is?

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

12. Area of a parallelogram which has vectors i and i + j as the adjecent sides is?

○ A: ½
○ B: 1
○ C: 2
○ D: √2

13. If ā x ƃ = i + 2j + 2k then ƃ x ā= ?

○ A: 1/3i + 2/3j + 2/3k
○ B: -i - 2j - 2k
○ C: 2i + 2j + k
○ D: None of the above.

14. If ā = ƃ then the value of triple scalar product ā.(ƃ x c) is?

○ A: 0
○ B: 1
○ C: -1
○ D: ā.ƃ

15. Which of the following quantities is undefined?

○ A: (i.i) / (i x j) ○ B: (i.j) / (j.j)

○ C: (j x k) / (i x j) ○ D: (i x k) / (j x j)

16. Which of the following statement is true?

If a.b = 0 a and b are parallel, If a x b = 0 then either a or b must be zero,

If a. (b x c) = 0 then a, b and c are coplanar.

○ A: iii only ○ B: i and ii only

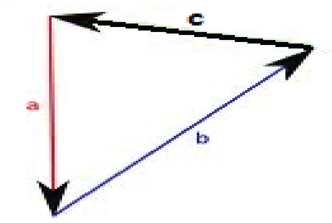
○ C: ii and iii only ○ D: i, ii and iii

17. If *u* = 2*i*ˆ - 4 ˆ*j* + 5*k*ˆ and *v* = 4*i*ˆ - 3 ˆ*j* - 4*k*ˆ then *u* and *v* are?

○ A: Parallel ○ B: Perpendicular

○ C: Equal ○ D: Opposite

18. Which of the following is true about the vector diagram given below?



○ A: c = a + b ○ B: c = a - b

○ C: a + b = 0 ○ D: a + b + c = 0

19. Which of the following position vectors have same magnitude?

a= [3,-4,2], b = [-3, 4, -2], c = [2, 4, 3]

○ A: a and b ○ B: a and c

○ C: All have same magnitude. ○ D: None of the has same magnitude.

20. In a parallelogram, the cross product of two adjacent vectors AB = i + 2j - 2j and BC = -2i + 2j + k is : 6i + 3j + 6k. The area of the parallelogram is?

○ A: 4.5 ○ B: 9

○ C: 15 ○ D: 18

I N D E X

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Sets & Functions

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Matrices & Determination

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Test 1 122
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Number Systems

TEST 1

1. **$i^{13} = ?$**

○ A: 1
○ B: -1
○ C: I
○ D: -i

2. **If $-1 + \sqrt{-3} = r\,e^{i\,\Theta}$ then Θ equals to?**

○ A: 2 pi / 3
○ B: -2 pi / 3
○ C: pi / 3
○ D: - pi / 3

3. **Square roots of -1 are?**

○ A: i , -I
○ B: i
○ C: 1
○ D: -i

4. $\left(\dfrac{2i}{1+i}\right)^2$ **is equal to?**

○ A: I
○ B: 2i
○ C: 1-I
○ D: 1-2i

5. **Conjugate of 4 + 5i is?**

○ A: -4 + 5i
○ B: 4 - 5i
○ C: $4^2 + (5i)^2$
○ D: 5 + 4i

6. **$(1 + i)^2 = ?$**

○ A: 2i
○ B: -2i
○ C: I
○ D: -i

7. **The value of** $\dfrac{i^{4n+1} - i^{4n-1}}{2}$ **is equal to?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

8. **If y and g are two complex numbers then** $\overline{y+g} = ?$

○ A: $\bar{Y} . \bar{g}$
○ B: $\bar{Y} / \bar{g}$
○ C: $\bar{Y} + \bar{g}$
○ D: $\bar{Y} - \bar{g}$

9. **(3 + 2i) + (1 + i) = ?**

○ A: 4 + 2i
○ B: 4 + 3i
○ C: 4 - 2i
○ D: 4 - 3i

10. **The complex number i + √3 in polar form can be written as?**

○ A: $\dfrac{1}{\sqrt{2}}\left(sin\ \ \pi/6 + i\ cos\ \pi/6\right)$
○ B: $2\left(cos\ \ \pi/6 + i\ sin\ \pi/6\right)$
○ C: $\dfrac{1}{2}\left(sin\ \ \pi/6 + i\ cos\ \pi/6\right)$
○ D: $4\left(cos\ \ \pi/6 + i\ sin\ \pi/6\right)$

11. **If g = 2 + i√3 then $g.\bar{g}$ = ?**

○ A: 2 - i√3
○ B: 13
○ C: 8
○ D: 7

12. **The moduli of complex number 1 - i√3 = ?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

13. **4 * (1 - 3i) = ?**

○ A: 4 - 3i
○ B: 40
○ C: 4 - 12i
○ D: None of the above.

14. **Multiplicative identity for complex numbers is?**

○ A: (0 , 0)
○ B: (0 , 1)
○ C: (1 ,1)
○ D: (1 , 0)

15. **If z is a complex number then | z1 . z2 | = ?**

○ A: $\sqrt{(z1)^2 + (z2)^2}$
○ B: $\sqrt{(z1)^2 - (z2)^2}$
○ C: | z1 | x | z2 |
○ D: | z1 | / | z2 |

16. **(5, 0) * (2 , 0) = ?**

○ A: 10
○ B: 10 + i
○ C: 10 + 2i
○ D: 10 + 5i

17. **If z = 1 + i then multiplicative inverse of z^2 is?**

○ A: 1 – I
○ B: i / 2
○ C: - i / 2
○ D: 2i

18. **What is the product of (1 + i) and (1 + 2i)?**

○ A: -2 + I
○ B: 2 + i
○ C: -1 + 3i
○ D: 1 + 3i

19. **The value of | -5i | is?**

○ A: 5
○ B: 10
○ C: 20
○ D: 25

20. $\left(\dfrac{1-i}{1+i}\right)^{20}$ **is equal to?**

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: -1

TEST 2

1. The complex number (1 + 2i) / (1 - i) lies in?

○ A: I quadrant
○ B: II quadrant
○ C: III quadrant
○ D: IV quadrant.

2. A complex number added to its additive inverse would give?

○ A: Multiplicative identity
○ B: Additive identity
○ C: Additive inverse.
○ D: Multiplicative inverse.

3. If y is a complex number then | -y | = ?

○ A: $| y |$
○ B: $| \bar{y} |$
○ C: $| -\bar{y} |$
○ D: All of the above.

4. If z is a complex number such that z + 1/z = 1 then the value of $z^{99} + 1/z^{99}$ is ?

○ A: 1
○ B: -1
○ C: 2
○ D: -2

5. Express in terms of *i* the sum of $\sqrt{-81}$ and $2\sqrt{-25}$.

○ A: 9i
○ B: -9i
○ C: 23i
○ D: 19i

6. Even integers (including zero) are closed under which of the following operation?

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: All of the above.

7. $\left[i^{67} + \frac{1}{i^{125}} \right] = ?$

○ A: 0
○ B: 2
○ C: 2i
○ D: -2i

8. If $F = x^3 + x^2 + 2x + 6$ then F(i) = ?

○ A: 3 + I
○ B: 5 + i
○ C: 3 – I
○ D: 2 - 5i

9. Find multiplicative inverse of √2 - i√5 ?

○ A: -(√2 / 7) + (√5 / 7)I
○ B: (√2 / 7) - (√5 / 7)i
○ C: (√2 / 7) + (√5 / 7)I
○ D: -(√2 / 7) - (√5 / 7)i

10. Square roots of number $(-3)^2$ are?

○ A: 3i , -3i
○ B: 3
○ C: -3i
○ D: 3, -3

11. If y is a complex number then $y \cdot \bar{y}$ = ?

○ A: $\bar{y}$ ○ B: y
○ C: $|-y|^2$ ○ D: None of the above.

The modulus of the complex number

12. $\dfrac{(1 - i\sqrt{3})(\cos\theta + i\sin\theta)}{2(1 - i)(\cos\theta - i\sin\theta)}$ **is**

○ A: 1/√2 ○ B: 1/2√2
○ C: 1/√3 ○ D: None of these.

13. $(\cos \Theta + i \sin \Theta)^n$ = ?

○ A: $(\cos \Theta^n + i \sin \Theta^n)$ ○ B: cos nΘ - i sin nΘ
○ C: cos nΘ + i sin nΘ ○ D: ncos Θ + i n sin Θ

14. $i^5 + i^6$ = ?

○ A: 1 + I ○ B: -1 + i
○ C: i ○ D: 2I

15. $(-1)^{-21/2}$ = ?

○ A: 0 ○ B: 1
○ C: I ○ D: -i

16. Multiplicative inverse of the complex number 1 + i is?

○ A: 1 – I ○ B: 1/2 + 1/2i
○ C: 1/2 - 1/2i ○ D: 1/√2 - i 1/√2

17. $\dfrac{2+i}{2-i} - \dfrac{2-i}{2+i} =$ **?**

○ A: i / 5 ○ B: i / 3
○ C: 8i / 5 ○ D: 7i / 5

18. The conjugate complex of number $(2 - i) / (1 - 2i)^2$ is equal to?

○ A: 2 / 25 + i 11 / 25 ○ B: 2 / 25 - i 11 / 25
○ C: - 2 / 25 + i 11 / 25 ○ D: - 2 / 25 - i 11 / 25

19. If $8iz^3 + 12z^2 - 18z + 27i = 0$, then?

○ A: |z| = 3/2 ○ B: |z| = 2/3
○ C: |z| = 1 ○ D: |z| = 1/3

20. (8 , 9) * (5, -6) =?

○ A: (14, -1) ○ B: (94, -3)
○ C: (48, -2) ○ D: None of the above.

TEST 3

1. The triangle formed by points 1 , $(1 + i) / \sqrt{2}$ and i in the argand diagram is?

○ A: Scalene ○ B: Equilateral
○ C: Isoceles ○ D: Right angled

2. The smallest integer n for which $\left(\frac{1+i}{1-i}\right)^n = 1$ **is?**

○ A: 4 ○ B: 8
○ C: 12 ○ D: 16

3. $i^{88} - i^{22} = ?$

○ A: I ○ B: -i
○ C: 1 ○ D: 2

4. If $a = |z_1| - |z_2|$ **;** $b = |z_1 + z_2|$ **and** $c = |z_1| + |z_2|$ **then which of the following is true?**

○ A: $c \leq b \leq a$ ○ B: $a \leq c \leq b$
○ C: $b \leq a \leq c$ ○ D: None of the above.

5. if $(\sqrt{3} + i)^{100} = 2^{99} (a + ib)$**, then b is equal to ?**

○ A: $\sqrt{3}$ ○ B: $\sqrt{2}$
○ C: 1 ○ D: None of the above.

6. Number of solutions for the equation $z^2 + \bar{z} = 0$ **is?**

○ A: One ○ B: Two
○ C: Three ○ D: Four

7. If *s* and *t* are different integers and $\sqrt{st} = 8$, which of the following could *not* be a value of $s + t$?

○ A: 16 ○ B: 20
○ C: 34 ○ D: 65

8. The modulus of $\sqrt{2i} - \sqrt{-2i}$ **is?**

○ A: 2 ○ B: $\sqrt{2}$
○ C: 0 ○ D: $2\sqrt{2}$

9. If $x = \sqrt{-1 - \sqrt{-1 - \sqrt{-1 - \sqrt{-1}}}}$ ... then x is equal to

○ A: w ○ B: w^2
○ C: w or w^2 ○ D: 0

10. The number of solutions for the equation $z^2 + |z|^2 = 0$ **are? (z is a complex number)**

○ A: One ○ B: Two
○ C: Three ○ D: Infinite

11. The smallest positive number n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is?

○ A: 12
○ B: 8
○ C: 4
○ D: 2

12. For positive integers $(1-i)^n \left(1-\frac{1}{i}\right)^n$ equals to?

○ A: 0
○ B: $2i^n$
○ C: 2^n
○ D: 4^n

13. The complex numbers sin x + i cos 2x and cos x - i sin 2x are conjugate to each other for ?

○ A: x = n * pi
○ B: x = (n + 1/2) * pi
○ C: x = 0
○ D: No value of x.

14. Which of the following numbers lie on the imaginary axis of the Argand diagram?

○ A: 8 + 3i
○ B: 0 + 3i
○ C: 8 + 0i
○ D: None of the above.

15. Cube roots of unity?

○ A: Are collinear
○ B: Lie on the circle of radius √3
○ C: Form an equilateral triangle.
○ D: None of the above.

16. Which of the following is true about complex numbers?

○ A: They do not have a multiplicative inverse.
○ B: They don’t have an additive inverse.
○ C: They always lie on the imaginary axis of the Argand diagram.
○ D: They don’t satisfy the order of axioms.

17. Sum of three consecutive odd numbers is always divisible by?

○ A: 2
○ B: 3
○ C: 4
○ D: 6

18. $(a - ib)^3$ = ?

○ A: $a^3 - i(3a^2b - b^3)$
○ B: $a^3 - 3ab^2 - i(3a^3 - b^3)$
○ C: $a^3 + 3ab^2 - i(3a^2b - b^3)$
○ D: $a^3 - 3ab^2 - i(3a^2b - b^3)$

19. If $p^2 - 2pq + q^2 = c$ where p and q are positive integers and p is even and q is odd which of the following is true?

○ A: c is even and a perfect square.
○ B: c is odd and a perfect square.
○ C: c is even and not a perfect square.
○ D: c is odd and not a perfect square.

20. If $\left[\frac{(\sqrt{3}/2) + i\,(1/2)}{(\sqrt{3}/2) - i\,(1/2)}\right]^{120} = a + i\,b$, then

○ A: a = cos 20° and b = - sin 20°
○ B: a = cos 20° and b = sin 20°
○ C: a = 0 and b = 1
○ D: a = 1 and b = 0

TEST 4

1. $\left|(1+i)\left(\frac{2+i}{3+i}\right)\right|$ **is equal to?**

○ A: -1/2
○ B: 1/2
○ C: 1
○ D: -1

2. The value of $(-i)^{1/3}$ is ?

○ A: -I
○ B: i
○ C: 1
○ D: None of the above.

3. Which of the following is an irrational number?

○ A: $\sqrt[3]{-8}$
○ B: $\sqrt{\frac{32}{50}}$
○ C: $5/\sqrt{5}$
○ D: All of the above.

4. If $(x + iy)(p + iq) = (x^2 + y^2)i$ then?

○ A: $p = x, q = y$
○ B: $p = x^2, q = y^2$
○ C: $q = x, p = y$
○ D: None of the above.

5. If $\odot$ is an operation on positive real numbers, for which of the following definitions of $\odot$ is $r \odot s = s \odot r$ (commutative property)?

○ A: $r \odot s = r - s$
○ B: $r \odot s = r / s$
○ C: $r \odot s = r^2 s$
○ D: $r \odot s = (r + s) / (rs)$

6. The complex number $1 + i\sqrt{3}$ in polar form is equal to?

○ A: $2\cos 60^\circ - i\,2\sin 60^\circ$
○ B: $4\cos 60^\circ + i\,4\sin 60^\circ$
○ C: $4\cos 60^\circ - i\,4\sin 60^\circ$
○ D: $2\cos 60^\circ + i\,2\sin 60^\circ$

7. (2 , 6) / (3 , 7) = ?

○ A: (6/29 , -1/29)
○ B: (2/29 , -2/29)
○ C: (24/29 , 2/29)
○ D: (18/29 , 2/29)

8. $\frac{(1+i)^n}{(1-i)^{n-2}}$ **is equal to?**

○ A: $4i^{n-2}$
○ B: $2i^{n-4}$
○ C: $2i^{n-1}$
○ D: None of the above.

9. **If $z = \frac{\sqrt{3}+i}{2}$, then $(z^{101} + i^{103})^{105}$ is equal to**

○ A: I
○ B: -1
○ C: 0
○ D: 1

10. Reciprocal of i is?

○ A: -1 ○ B: 1

○ C: I ○ D: -i

11. $\frac{(1+i)^{2n+1}}{(1-i)^{2n-1}}$ is equal to?

○ A: 2 $(-1)^n$ ○ B: 2i

○ C: -2 ○ D: 2 + 2i

12. If $\bar{Y}$ = y then y is?

○ A: Complex number ○ B: Real number

○ C: $\bar{Y}$ is complex conjugate of y ○ D: None of the above.

13. The equation $| z - 1 |^2 + | z + 1 |^2 = 2$ represents?

○ A: A circle of radius 1 ○ B: A circle of radius 2

○ C: Ordered pair (0, 0) ○ D: A straight line.

14. The number 4 + 3i lies on the ?

○ A: Imaginary axis of the Argand diagram. ○ B: Real axis of the Argand diagram.

○ C: Neither real nor imaginary axis of the Argand diagram.

○ D: None of the above.

15. Absolute value of complex number z = a + ib = ?

○ A: a + b ○ B: $a^2 + b^2$

○ C: $\sqrt{z.\tilde{z}}$ ○ D: $z.\tilde{z}$

16. $\text{If } z = \left(\frac{\sqrt{3}}{2}+\frac{1}{2}i\right)^5 + \left(\frac{\sqrt{3}}{2}-\frac{1}{2}i\right)^5$, then

○ A: Re (z) > 0 ○ B: Re (z) > 0 and Im (z) > 0

○ C: Re (z) > 0 and Im (z) < 0 ○ D: Im (z) = 0

17. $\sqrt{\frac{1}{-4}}$ is equal to?

○ A: i / 2 ○ B: - i / 2

○ C: 2 I ○ D: -2 i

18. If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$ then α^{31} is equal to?

○ A: α ○ B: α^2

○ C: 0 ○ D: 1

19. (a + bi) * (c + di) = ?

○ A: (ac - bd) + (ad + bc) I ○ B: (ac + bd) + (ad + bc) i

○ C: (ac - bd) + (ad - bc) I ○ D: (ac + bd) + (ad - bc) i

Sets & Functions

TEST 1

1. If A ∩ B = Φ then A and B are called?

○ A: Complement of each other.
○ B: Null sets
○ C: Disjoint sets
○ D: Universal sets.

2. Residue class modulo 5 for 4 + 3 is?

○ A: 2
○ B: 3
○ C: 5
○ D: 7

3. (A U B)' = ?

○ A: A' U B'
○ B: A' ∩ B'
○ C: A – B
○ D: (A - B)'

4. If A = {1,2,3} and B = {2,3}, then A U B =?

○ A: {1}
○ B: {2,3}
○ C: {1,2}
○ D: {1,2,3}

5. A set of all possible sub sets of a set is known as?

○ A: Power set
○ B: Proper subset
○ C: Singleton Set
○ D: Universal set.

6. A ∩ B = Φ then (A U B) = ?

○ A: (A U B) = A + B
○ B: (A U B) = A + B - (A ∩ B)
○ C: (A U B) = (A ∩ B)
○ D: Undefined.

7. Set of all integers is not closed with respect to?

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: Division

8. Which of the following is a singleton set?

○ A: { }
○ B: {0}
○ C: {5}
○ D: Both B and C.

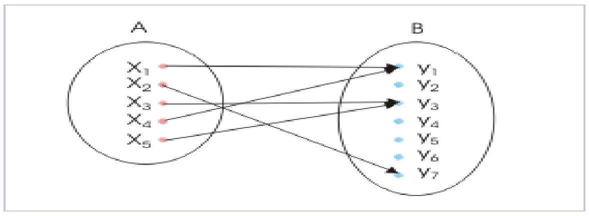
9. Drawing conclusion from limited number of observations is called?

○ A: Induction
○ B: Deduction
○ C: Logic
○ D: Proposition

10. Z = {x | x = p/q where p,q Є Z and q ≠ 0} is a set of?

○ A: Natural numbers
○ B: All integers
○ C: Irrational numbers
○ D: Rational numbers.

11. The figure below shows what kind of function?



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function

12. Which of the following relations is true?

○ A: $0 \in \{ \}$
○ B: $0 \in \{\Phi\}$
○ C: $0 \in \{0\}$
○ D: None of the above.

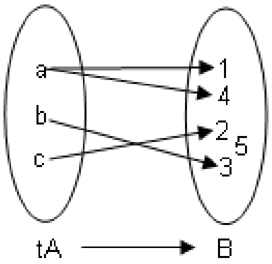
13. Which of the following is defined with respect to the universal set?

○ A: Difference of two sets.
○ B: Intersetction of sets
○ C: Union of sets
○ D: Complement of sets

14. Aristotelian logic has how many possible outcomes?

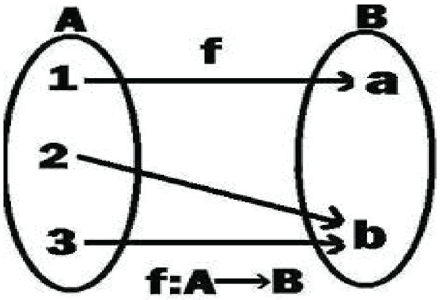
○ A: 1
○ B: 2
○ C: 3
○ D: 4

15. The diagram below shows that?



○ A: f is function from A to B
○ B: f is a one-one function from A to B
○ C: f is an onto function from A to B
○ D: f is not a function

16. The figure below shows what kind of function?



○ A: Into function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

17. The domain of the function f = {(1, 3), (3, 5), (2, 6)} is?

○ A: 1, 3 and 2
○ B: {1,3,2}
○ C: 3, 5 and 6
○ D: {3,5,6}

18. Residue class modulo 7 for 9 + 5 is?

○ A: 14
○ B: 7
○ C: 3
○ D: 0

19. There are how many ways of describing a set?

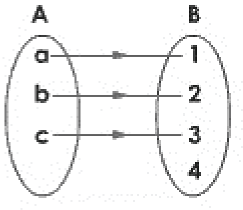
○ A: 1
○ B: 2
○ C: 3
○ D: 4

20. If A is a subset of B then A U B =?

○ A: A
○ B: B
○ C: A – B
○ D: B - A

TEST 2

1. **The figure below shows what kind of function?**



○ A: Into Function
○ B: (1-1) and into function
○ C: Onto function
○ D: (1-1) and onto function.

2. **If $(x + 3, y - 2) = (7,5)$ then $(7x, 9y) = ?$**

○ A: $(3,-2)$
○ B: $(28,63)$
○ C: $(35,42)$
○ D: $(49,54)$

3. **If $f = \{(1, 4), (2, 5), (3, 6)\}$ and $g = \{(4, 8), (5, 7), (6, 9)\}$, then (gof) is?**

○ A: $\{\ \}$
○ B: $\{(1, 8), (2, 7), (3, 9)\}$
○ C: $\{(1, 7), (2, 8), (3, 9)\}$
○ D: None of the above.

4. **Logical form of $(A \cup B)' = A' \cap B'$ is?**

○ A: $\sim(p \vee q) = \sim p \wedge \sim q$
○ B: $\sim(p \wedge q) = \sim p \vee \sim q$
○ C: $(p \vee q) = p \wedge q$
○ D: $(p \vee q) \rightarrow \sim p \wedge \sim q$

5. **If A and B are overlapping sets then $A - B =$?**

○ A: A
○ B: B
○ C: $A - (A \cap B)$
○ D: $B - (A \cap B)$

6. **To be classified as a group, the set must satisfy how many properties?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

7. **Set of rational + irrational numbers is a set of?**

○ A: All integers
○ B: All real numbers
○ C: Whole numbers
○ D: All of the above.

8. **Let $A = \{1, 2, 3\}$. Then, the domain of the relation $R = \{(1, 1), (2, 3), (2, 1)\}$ defined on A is?**

○ A: $\{1,2\}$
○ B: $\{1,3\}$
○ C: $\{1,2,3\}$
○ D: None of the above.

9. **All students who appear in GIKI entry test are pass, fail or put in the waiting list. If I appear in the GIKI entry test, I may pass, fail or be in the waiting list. This is an example of (choose the most appropriate answer)?**

○ A: Induction
○ B: Deduction
○ C: Aristotelian logic
○ D: Non Aristotelian logic

10. $A - B = \Phi$ and A is not an empty then?

○ A: $B = \Phi$

○ B: $B - A = \Phi$

○ C: A is subset of B

○ D: B is subset of A.

11. If a set has 5 elements. Then number of elements in the power set would be?

○ A: 4

○ B: 8

○ C: 16

○ D: 32

12. Let A and B have 3 and 6 elements, respectively. What can be the minimum number of elements in A U B?

○ A: 3

○ B: 6

○ C: 9

○ D: Cannot determine.

13. If $f : A \rightarrow B$ be defined by $f(x) = x + i$, where i is a fixed integer and x set of integers, then f is?

○ A: Onto function

○ B: Into function

○ C: (1-1) and into function.

○ D: (1-1) and onto function.

14. If a set is closed with respect to an operation and the operation is associative then the set is called?

○ A: Semi group

○ B: Group

○ C: Monoid

○ D: Both A and C.

15. If $A = \{1, 2, 3\}$ and $B = \{3, 4\}$ and $C = \{4, 5, 6\}$ then $(A \times B) \cap (B \times C) =$?

○ A: $\{(1,4)\}$

○ B: $\{(3,4)\}$

○ C: $\{(1,4), (3,4)\}$

○ D: $\{(2,4), (1,3)\}$

16. The function $f = \{(1,2), (1,3), (1,4)\}$ is a ?

○ A: Into function

○ B: Onto function

○ C: (1-1) onto function

○ D: None of the above.

17. Converse of $q \rightarrow p$ is?

○ A: $p \rightarrow q$

○ B: $\sim p \rightarrow \sim q$

○ C: $\sim q \rightarrow \sim p$

○ D: $\sim p \rightarrow q$

18. Set of all integers such that $|x-3| < 2$ is?

○ A: $\{1,2,3,4\}$

○ B: $\{1,2,3,4,5\}$

○ C: $\{2,3,4\}$

○ D: None of the above.

19. If $A=\{1,2,3\}$, $B = \{1,2,3\}$ and $C = \{3,2,1\}$ which of the following is true?

○ A: $A = B$

○ B: C is inverse of A

○ C: $A = B = C$

○ D: Both A and B.

20. If A is a subset of B then $A - B =$?

○ A: A

○ B: B

○ C: $A - (A \cup B)$

○ D: Φ

TEST 3

1. **In a town, 48% people are educated, 51% people are young, 60% are servicemen, 24% are educated and young, 25% are young and servicemen, 27% are educated and servicemen and 5% have all three characteristics. How many people (in percentage terms)do not have any of these three characteristics?**

   ○ A: 12% ○ B: 9%

   ○ C: 5% ○ D: 0%

2. **The table below shows multiplication operation on a set $S = \{1,-1,i,-i\}$. Which of the following is most accurate about the set w.r.t multiplication?**

x	1	−1	i	$-i$
1	1	−1	i	$-i$
−1	−1	1	$-i$	i
i	i	$-i$	−1	1
$-i$	$-i$	i	1	−1

   ○ A: It is a monoid ○ B: It is a group

   ○ C: It is an abelian group ○ D: It is a semi group

3. **In a zoo, there are 42 animals in the first sector, 34 in the second sector and 20 in the third sector. Out of these, 24 graze in sector one and also in sector two, 10 graze in sector two and sector three and 12 graze in sector one and sector three. These figures also include four animals grazing in all the three sectors. Find the total number of animals?**

   ○ A: 46 ○ B: 50

   ○ C: 54 ○ D: 60

4. **Let R be a relation in N defined by $R = \{(1+x , x^2) : x < 5 \text{ and } x \in N\}$. Which of the following is false?**

   ○ A: Domain of $R = \{2,3,4,5\}$ ○ B: Range of $R = \{4,9,16,25\}$

   ○ C: $R = \{(1,2) , (2,4) , (3,9) , (4,16) , (5,25)\}$ ○ D: $R = \{(2,4) , (3,9) , (4,16) , (5,25)\}$

5. **For $b \in N$, $bN = \{bx : x \in N\}$ then the first value of the set $6N \cap 8N$ is?**

   ○ A: 8 ○ B: 16

   ○ C: 24 ○ D: 48

6. **Which of the following is a Singleton set?**

   ○ A: $\{ x : |x|=5 , x \in N\}$ ○ B: $\{ x : |x|=15 , x \in Z\}$

   ○ C: $\{ x : x^2 , x \in Z\}$ ○ D: $\{ x : 1 + x , x \in N\}$

7. **The set $\{x : x \neq x\}$ is?**

   ○ A: $\{0\}$ ○ B: $\{\Phi\}$

   ○ C: $\{1\}$ ○ D: $\{ \}$

8. **If $N_a = \{an : n \in N\}$, find the value of $N_6 \cap N_8$?**

   ○ A: N_6 ○ B: N_8

   ○ C: N_{12} ○ D: N_{24}

9. **If $n(A) = 115$, $n(B) = 326$ and $n(A \cap B) = 65$. Then $n(A \cup B) = ?$**

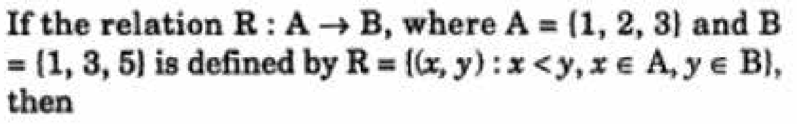
   ○ A: 68 ○ B: 73

   ○ C: 128 ○ D: 376

10. Which of the following cannot have a proper subset?

○ A: $\{ x : x \in N\}$ ○ B: $\{ x : x \in Q, 3 < x < 4\}$

○ C: $\{ x : x \in N, 3 < x < 4\}$ ○ D: $\{ x : x \in Z, 3 < x < 6\}$

11. 

If the relation $R : A \rightarrow B$, where $A = \{1, 2, 3\}$ and $B = \{1, 3, 5\}$ is defined by $R = \{(x, y) : x < y, x \in A, y \in B\}$, then

○ A: $R = \{(1,3) , (1,5) , (2,3) , (2,5) , (3,5)\}$ ○ B: $R = \{(1,3) , (1,5) , (2,3) , (2,5) \}$

○ C: $R^{-1} = \{(3,1) , (5,1) , (3,2) , (5,2) , (3,3) \}$ ○ D: $R = \{(1,1) , (1,3) , (1,5) , (2,3) , (2,5) \}$

12. Set of cube roots of unit w.r.t addition is?

○ A: Semi group ○ B: Group

○ C: Monoid ○ D: None of the above.

13. If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9 (n - 1) : n \in N\}$, find the value of X U Y?

○ A: X ○ B: Y

○ C: N ○ D: None of the above.

14. Let R by a relation in N defined by $R = \{(x,y) : x + 2y = 8\}$. The range of R is?

○ A: {2,4,6} ○ B: {1,2,3}

○ C: {2,4,6,8} ○ D: {1,2,3,4,5,6}

15. What are the missing entries in the conditional table below? (From top to bottom)

p	q	$p \rightarrow q$
T	T	?
T	F	?
F	T	?
F	F	?

○ A: T, F, F, T ○ B: T, T, T, F

○ C: T, F, T, F ○ D: T, F, T, T

16. The number of relations that can be defined on the set A = {a, b, c, d} is?

○ A: 16 ○ B: 24

○ C: 4^4 ○ D: 2^{16}

17. If n(A) = 115 , n(B) = 326 and n(A-B) = 47, then $n(A \cap B)$ = ?

○ A: 373 ○ B: 158

○ C: 68 ○ D: 44

18. Which of the following is an empty set?

○ A: $\{ x : x \in R \text{ and } x^2 - 3 = 0\}$ ○ B: $\{ x : x \in R \text{ and } x^2 + 3 = 0\}$

○ C: $\{ x : x \in R \text{ and } x + 11 = 0\}$ ○ D: $\{ x : x \in R \text{ and } x^4 - 3 = 0\}$

19. If for two sets A and B we have $(A \cup B) = (A \cap B) = B$, then we have?

○ A: $B = \Phi$ and $A \neq \Phi$ ○ B: $A - B = \Phi$

○ C: $B - A = \Phi$ ○ D: $A = B$

20. The set of fourth roots of unity are closed with respect to?

○ A: Addition ○ B: Division

○ C: Subtraction ○ D: None of the above.

TEST 4

1. The inverse of function {(1,2) , (2,3) , (3,4)} is?

○ A: {(1,2) , (2,3) , (3,4)} ○ B: {(1,1/2) , (1/2,1/3) , (1/3,1/4)}

○ C: {(2,1) , (3,2) , (4,3)} ○ D: {(-1,-2) , (-2,-3) , (-3,-4)}

2. 46 in binary is?

○ A: 100110 ○ B: 101111

○ C: 101110 ○ D: 101010

3. In a town with a population of 5000, the number of people who are egg eaters is 3200. If 2500 are meat eaters and 1500 eat both egg and meat. How many of them eat neither meat nor egg?

○ A: 4200 ○ B: 1500

○ C: 800 ○ D: 500

4. If A = {1,2,3,4} then {(x,y) | x+y < 5} is a ?

○ A: Onto function ○ B: Into function

○ C: (1-1) and into function ` ○ D: Not a function.

5. If A and B are disjoint sets then A - B = ?

○ A: A ○ B: B

○ C: B – A ○ D: Both A and C.

6. A group is called abelian group if?

○ A: It is closed ○ B: It satisfies associativity

○ C: It has inverse as part of the group. ○ D: It satisfied commutativity.

7. Let A = {a, b, c}. Then, the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is?

○ A: {a, b, c} ○ B: {a, b}

○ C: {a} ○ D: {b,c}

8. Contrapositive of $p \rightarrow q$ is?

○ A: $q \rightarrow p$ ○ B: $\sim p \rightarrow \sim q$

○ C: $\sim q \rightarrow \sim p$ ○ D: $\sim p \rightarrow q$

9. X = {0,1,2,3,4 .....} is a set of?

○ A: Natural numbers ○ B: Whole numbers

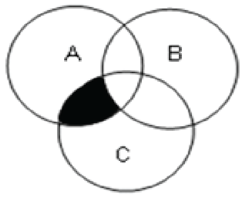
○ C: All integers ○ D: All of the above.

10. All Irish people drink beer. If someone is Irish he would definitely drink beer. The logic is an example of?

○ A: Proposition ○ B: Induction

○ C: Deduction ○ D: Logic analysis

The shaded area in this diagram represents



11.

○ A: $A \cap C$ ○ B: $(A \cap B) - C$

○ C: $(A - C) \cap (A - B)$ ○ D: $(A \cap C) - B$

12. Set of natural numbers is closed with respect to?

Addition, Multiplication, Subtraction

○ A: i only ○ B: ii only

○ C: i and ii only ○ D: i, ii and iii

13. If a function f: A→B is such that Ran f = B then f is a/an ?

○ A: Into function ○ B: Onto function

○ C: (1 – 1) and onto ○ D: Both B and C.

14. A, B and C are three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Which of the following conditions is true according to the given statement?

○ A: $A = B$ ○ B: $B = C$

○ C: $A = C$ ○ D: $A = B = C$

15. The set of cube roots of unit is closed with respect to?

○ A: Multiplication ○ B: Addition

○ C: Subtraction ○ D: None of the above.

16. If set $A = \{1, w, w^2\}$ is an abelian group then inverse of w is?

○ A: 1 ○ B: w

○ C: w^2 ○ D: Abelian group does not have an inverse.

17. The range of the function $f(x) = |x - 1|$ is? Where domain is the set of all integers.

○ A: $(-\infty, \infty)$ ○ B: $(0, \infty)$

○ C: $[0, \infty)$ ○ D: $(-\infty, 0)$

18. Which of the following is true about the null set?

It is the subset of every set. Number of elements in its power set is zero. It contains no elements

○ A: iii only ○ B: i and iii only

○ C: ii and iii only ○ D: i, ii and iii.

19. $Z = \{x \mid x \neq p/q$ where $p, q \in Z$ and $q \neq 0\}$ is a set of?

○ A: Natural numbers ○ B: All integers

○ C: Irrational numbers ○ D: Rational numbers.

20. If $A \cap B \neq \Phi$ then $(A \cup B) = ?$

○ A: $A + B$ ○ B: $(A \cup B) = A + B - (A \cap B)$

○ C: $(A \cup B) = A + B + (A \cap B)$ ○ D: Φ

Matrices & Determinations

TEST 1

1. **Inverse of the matrix $\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ is?**

○ A: $10\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$ ○ B: $\frac{1}{10}\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$

○ C: $\frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$ ○ D: $10\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

2. **The matrix below has order of?**

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

○ A: 6 x 1 ○ B: 2 x 3

○ C: 3 x 2 ○ D: 2 x 2

3. **If A and B are matrices, then which from the following is true ?**

○ A: $A + B \neq B + A$ ○ B: $(A^t)^t \neq A$

○ C: $AB \neq BA$ ○ D: All are true.

4. **A squar matrix is one in which?**

○ A: $n = m^2$ ○ B: $n^2 = m$

○ C: $n = m$ ○ D: All numbers are squares of integers.

5. **The number of non-zero rows in an echlon form is called ?**

○ A: reduced echlon form ○ B: rank of the matrix

○ C: conjugate of the matrix ○ D: co-factor of the matrix

6. **M_{12} the matrix given below is?**

$$\begin{vmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{vmatrix}$$

○ A: $\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix}$ ○ B: $\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix}$

○ C: $\begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix}$ ○ D: $\begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix}$

7. **The matrix given below is a?**

$$\begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 2 & 1 & 5 \end{bmatrix}$$

○ A: Symmetric. ○ B: Skew Symmetric

○ C: Hermitian ○ D: Skew Hermitian

8. What is the order of the matrix given below?

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

○ A: 6 x 1 ○ B: 2 x 3

○ C: 3 x 2 ○ D: 2 x 2

9. Determinant of singular matrix is ?

○ A: 1 ○ B: positive

○ C: negative ○ D: 0

10. If the system of equations $x - Ky - z = 0$, $Kx - y - z = 0$, $x + y - z = 0$ has a non-zero solution, then the possible values of K are?

○ A: -1, 2 ○ B: 1, 2

○ C: 0, 1 ○ D: -1, 1

11. The following matrix is?

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{bmatrix}$$

○ A: Non singular ○ B: Unit matrix

○ C: Lower triangle. ○ D: Upper Triangle.

12. Value of $\begin{vmatrix} w & 1 & w \\ w & 2 & w \\ w & 3 & w \end{vmatrix}$ **is?**

○ A: w ○ B: 0

○ C: 1 ○ D: 2

13. If A = $\begin{bmatrix} 2 & 5 \\ 5 & 2 \end{bmatrix}$**, then $A^3 - 4A^2$ is equal to**

○ A: $\begin{bmatrix} 42 & 105 \\ -105 & 42 \end{bmatrix}$ ○ B: $\begin{bmatrix} 42 & 105 \\ 105 & 42 \end{bmatrix}$

○ C: $\begin{bmatrix} 105 & 42 \\ 105 & 42 \end{bmatrix}$ ○ D: None of the above.

14. A determinant remains same if :

○ A: Every element in a column is multiplied by the same factor

○ B: Two columns are interchanged. ○ C: Two rows are interchanged.

○ D: Each element of any row is added to the corresponding element of any other row multiplied by given factor

15. For matrices $(AB)^t$ = ?

○ A: A^tB^t ○ B: AB

○ C: B^tA^t ○ D: BA

16. If A = $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A|$ is?

○ A: 2 ○ B: 3

○ C: 4 ○ D: 5

17. If AB = A then, B is a?

○ A: Unity Matrixq ○ B: Identity Matrix

○ C: Inverse of A ○ D: Both A & B.

18. If the order of matrix *A* is *m* x *p*. And the order of *B* is *p* x *n*. Then the order of *AB* is ?

○ A: m x p ○ B: p x n

○ C: m x n ○ D: n x m

19. For matrices A^{-1} = ?

○ A: $Adj\ A\ |A|$ ○ B: $|A|\ \frac{1}{Adj\ A}$

○ C: $\frac{1}{|A|\ A} Adj\ A$ ○ D: $\frac{1}{|A|} Adj\ A$

TEST 2

1. Inverse for the matrix $a = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is?

○ A: $\frac{1}{ad-bc}\begin{bmatrix} d & b \\ c & a \end{bmatrix}$ ○ B: $\frac{1}{ab-cd}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

○ C: $\frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ ○ D: $\frac{1}{ad-bc}\begin{bmatrix} -d & -b \\ -c & -a \end{bmatrix}$

2. For matrices if AX = B then which of the following conditions holds?

○ A: $X = A^{-1}B$ ○ B: $A^{-1}(AX) = BA^{-1}$

○ C: $X = BA^{-1}$ ○ D: All of the above.

3. For matrices, if AX=B then X = ?

○ A: B / |A| ○ B: $\frac{1}{|A|} * adj(A.B)$

○ C: $B.(\frac{1}{|A|} adj A)$ ○ D: $(\frac{1}{|A|} * adj A).B$

4. Fine the cofactor A_{23} for the matrix $\begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix}$

○ A: 7 ○ B: 0

○ C: 23 ○ D: -7

5. The matrix $B = \begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$ **can be defined as?**

○ A: Symmetric	`○ B: Skew Symmetric
○ C: Triangular	○ D: Hermitian

6. Find the cofactor A_{22} for the $\begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

○ A: 8	○ B: -7
○ C: -10	○ D: 3

7. If A is a square matrix, then A^{-1} does not exist if

○ A: $\lvert A\rvert>0$	○ B: $\lvert A\rvert<0$
○ C: $\lvert A\rvert=0$	○ D: $A\neq 0$

8. Value of determinance is?

○ A: 0	○ B: 1
○ C: x+y+z+w	○ D: xyzw

If

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

9. then order of matrix A = ?

○ A: 3 x 2	○ B: 2 x 3
○ C: 3 x 3	○ D: 2 x 2

10. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

○ A: 8	○ B: -8
○ C: 400	○ D: 0

11. If I is an identity matrix, then?

○ A: $I^n=0$	○ B: $I^n=I$
○ C: 2I=0	○ D: None of these.

12. If x, y and z are non zero numbers. The inverse of matrix $\begin{bmatrix} x & y \\ z & 1 \end{bmatrix}$ **is?**

○ A: $\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$	○ B: $\frac{1}{x-yz}\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$
○ C: $\begin{bmatrix} 1 & -y \\ -z & -x \end{bmatrix}$	○ D: None of these.

13. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then?

○ A: $\alpha = a^2 + b^2, \beta = -2ab$
○ B: $\alpha = a^2 + b^2, \beta = ab$
○ C: $\alpha = a^2 - b^2, \beta = 2ab$
○ D: $\alpha = a^2 + b^2, \beta = 2ab$

14. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 23 \\ 0 & -10 \end{bmatrix}$ then |AB| is?

○ A: 80
○ B: 100
○ C: -110
○ D: 90

15. The number of non-zero rows when a matrix is reduced to echelon matrix form is known as?

○ A: Rank of the matrix.
○ B: Degree of matrix.
○ C: Skew echelon of matrix.
○ D: None of the above.

16. If augmented matrix of a system is of form $\begin{bmatrix} 1 & 0 & : & 5 \\ 0 & 1 & : & -3 \end{bmatrix}$ Solution to the equations of the system is?

○ A: 1 and 0
○ B: 0 and 1
○ C: 5 and -3
○ D: None of the above.

17. The value of the determinant given below is equal to

$$\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$$

○ A: 6 xyz
○ B: xyz
○ C: 4 xyz
○ D: xy + yz +zx

18. If a matrix A is multiplid with a number k then the determinant of resulting matrix is?

○ A: k |A|
○ B: 1/k |A|
○ C: k^2|A|
○ D: |A|

19. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

○ A: -3, 1
○ B: -1, 3
○ C: 3, 1
○ D: -3, -1

20. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ then A^2= ?

○ A: $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$
○ B: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
○ C: $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
○ D: $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

TEST 3

1. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

○ A: [2, 4] ○ B: [0, 4]

○ C: [1, 4] ○ D: None of these.

2. **If A and B are symmetric matrices, then AB + BA is a?**

○ A: Symmetric matrix ○ B: Skew symmetric matrix

○ C: Diagonal matrix ○ D: Triangular matrix

3. **Which of the following is an Echelon form of a matrix?**

○ A: $\begin{bmatrix} 0 & 1 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ ○ B: $\begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 0 & 2 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 8 \end{bmatrix}$ ○ D: Both A & B.

4. **1, 2, 3, 4 are four numbers. If a matrix of order m x n is formed by using all the four numbers, then how many set of values (m, n) are possible?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

5. If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

○ A: $\begin{bmatrix} 13 & 4 \\ 8 & 5 \end{bmatrix}$ ○ B: $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$ ○ D: $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

6. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x, y not equal to zero, then D is

○ A: Divisible by neither x nor y. ○ B: Divisible by both x and y

○ C: Divisible by x but not y ○ D: Divisible by y but not x

7. $\begin{vmatrix} a+x & b & c \\ a & b+y & c \\ a & b & c+z \end{vmatrix}$ is equal to

○ A: $xyz\,(1 + a/x + b/y + c/z)$ ○ B: $xyz\,(1 + x/a + y/b + z/c)$

○ C: $xyz\,(1 + x + y + z)$ ○ D: $xyz\,(1 + a + b + c)$

Let A = $\begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$

8. If $|A|^2 = 25$, then $|\alpha|$ is equal to

○ A: 1/5q
○ B: 5
○ C: 1
○ D: 25

9. If A = $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ such that $A + A^C = I$, then value of α is

○ A: $\pi/6$
○ B: $\pi/3$
○ C: π
○ D: 0

10. Which is the following is the condition for a Skew Hermitian matrix?

○ A: $(\bar{A})^t = A$
○ B: $(\bar{A})^t = A^2$
○ C: $(\bar{A})^t = -A$
○ D: $\bar{A}^t = -A^2$

11. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$, where a = i, b = ω, c = ω^2, then Δ is equal to

○ A: I
○ B: -1
○ C: 1
○ D: -i

12. If f(x) = $\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$, then f(100) is equal to

○ A: 0
○ B: 1
○ C: 100
○ D: -100

13. The solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$ is

○ A: 1, 2, 3
○ B: 1, 2, -3
○ C: -1, 2, 3
○ D: -1, -2, 3

14. Which of the following is true for Echelon Form of a Matrix?

○ A: In any row, the number of zeros before the leading entry is greater than the number of such zeros in the preceding row.

○ B: All non zero rows preceeds row including zeros.

○ C: First entry in any non zero row is 1.

○ D: All of the above.

15. The matrix $A = \begin{bmatrix} 1 & 1-i \\ 1+i & 2 \end{bmatrix}$ **is a?**

○ A: Symmetric Matrix
○ B: Hermitian Matrix
○ C: Skew symmetric matrix
○ D: Skew hermitian matrix

16. The value of the determinate $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

○ A: 5√3 (-√6 – 5)

○ B: 5√3 (√6 – 5)

○ C: 5√3 (5 - √6)

○ D: √3 (√6 – 5)

17. If A and B are symmetric matrices, then AB would equal to?

○ A: -BA

○ B: BA

○ C: 0

○ D: I

18. In reduced echelon form of the matrix if first non zero entry of a row lies in Column j, all other entries in the column are?

○ A: Positive

○ B: Negative

○ C: Zero

○ D: None of the above.

TEST 4

1. For the matrix below find the |A|?

$$A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

○ A: 30

○ B: 40

○ C: 50

○ D: 60

2. A triangular matrix is always a?

○ A: Echelon form of Matrix.

○ B: Reduced Echelon form of Matrix.

○ C: Square matrix.

○ D: Non of the above.

3. What is the conjugate of matrix $A = \begin{bmatrix} i & 10+i \\ -2i & 1-i \end{bmatrix}$

○ A: $\begin{bmatrix} -i & 10+i \\ -2i & 1+i \end{bmatrix}$

○ B: $\begin{bmatrix} i & 10-i \\ 2i & 1-i \end{bmatrix}$

○ C: $\begin{bmatrix} -1 & 10-i \\ 2 & 1+i \end{bmatrix}$

○ D: $\begin{bmatrix} -i & 10-i \\ 2i & 1+i \end{bmatrix}$

4. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

○ A: α=1

○ B: α=0

○ C: α=-1

○ D: None of these.

5. The matrix A = $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ can be described as?

○ A: Hermitian
○ B: Skew Hermitian
○ C: Symmetric
○ D: Skey Symmetric.

For a system of equations,

$x + 3y + 2z = 3$

$4x + 5y - 3z = -3$

$3x - 2y + 17z = 42$

6. Fine the values of x, y and z if the echelon form of matrix is $\begin{bmatrix} 1 & 3 & 2 & :3 \\ 0 & 1 & -1 & :-3 \\ 0 & 0 & 1 & :2 \end{bmatrix}$

○ A: x = 2 ; y = -1; z = 2
○ B: x = -2 ; y= 1; z= 2
○ C: x = 4 ; y = -1; z = 2
○ D: x= 2 ; y =-2; z = 2

7. Find the value of a if the following matrix is singular $\begin{bmatrix} -4 & 2 \\ -6 & a \end{bmatrix}$

○ A: -3
○ B: 3
○ C: 5
○ D: -5

8. If A=$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A is symmetric then?

○ A: x=0, y=5
○ B: x+y=5
○ C: x=y
○ D: None of the above.

9. Let $A = \begin{vmatrix} 1 & bc & a(b+c)) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b)) \end{vmatrix}$**. Value of A is equal to?**

○ A: ab + bc +ca
○ B: a + b + c
○ C: $(a + b + c)^2$
○ D: None of the above

10. If in a square matrix A two rows or two columns are interchanged the determinant of the resulting matrix is?

○ A: A^{-1}
○ B: -|A|
○ C: |A|
○ D: None of the above.

11. What is the rank of the matrix $A = \begin{bmatrix} 1 & 0 & 7 & -2 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

○ A: 1
○ B: 2
○ C: 3
○ D: 4

12. What is value of the determinant $A = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{vmatrix}$

○ A: 25 ○ B: -25

○ C: 30 ○ D: -30

13. If ω is the cube root of unity then the value of is ?

○ A: $a^3 + b^3 + c^3$ ○ B: ab - bc

○ C: 0 ○ D: $a^3 + b^3 + c^3 -3abc$

14. If x + ay = 0; y + az = 0; z + ax = 0, then the value of 'a' for which the system of equations will have infinite number of solutions is?

○ A: 1 ○ B: 0

○ C: -1 ○ D: None of these.

Quadratic Equations

TEST 1

1. **Find the value of x where $9x^2 - 12x - 5 = 0$.**

○ A: -1/3 , 5/3 ○ B: -2/3 , 5/3

○ C: -1/3, 2/3 ○ D: 2/3 , 5/3

2. **$\omega^{-12} = ?$**

○ A: ω ○ B: ω^2

○ C: 1 ○ D: 0

3. **If x-a is a factor of f(x) then f(a) = ?**

○ A: a ○ B: 0

○ C: 1 ○ D: w

4. **Solution to the equation $6x^2 + x - 15 = 0$ is?**

○ A: 3/2 , -3/2 ○ B: 6/7 , -4/5

○ C: 3/2 , -5/3 ○ D: None of the above.

5. **Roots of the equation $2x^2 + 5x - 1$ are?**

○ A: Complex ○ B: Irrational

○ C: Equal ○ D: Rational

6. **The condition for polynomial equation $ax^2 + bx + c = 0$ to be quadratic is?**

○ A: $a > 0$ ○ B: $a < 0$

○ C: $a \neq 0$ ○ D: $a \neq 0$ and $b \neq 0$

7. ***If the product of the roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, the value of m is?***

○ A: 1 ○ B: -1

○ C: 1/3 ○ D: -1/3

8. **Quadratic equations are?**

○ A: First degree polynomials. ○ B: Second degree polynomials.

○ C: Third degree polynomials. ○ D: Fourth degree polynomials.

9. **$1 + \omega + \omega^2 = ?$**

○ A: 1 ○ B: ω

○ C: ω^2 ○ D: 0

10. **For quadratic equation $ax^2 + bx + c = 0$, Sum of roots is equal to?**

○ A: b/a ○ B: -b/a

○ C: c/a ○ D: -c/a

11. **If S and P are the sum and products of the roots of the quadratic equation, then the equation may be written as?**

○ A: $x^2 + Sx + P = 0$ ○ B: $x^2 - Sx - P = 0$

○ C: $x^2 - Sx + P = 0$ ○ D: $x^2 + Sx - P = 0$

12. Roots of the equation $x^2 + 7x + 12$ are?

○ A: 3, 4
○ B: -3, 4
○ C: 3, -4
○ D: -3, -4

13. Sum of all fourth roots of unit is?

○ A: 1
○ B: -1
○ C: 0
○ D: *i*

14. Product of all fourth roots of unity are?

○ A: 1
○ B: -1
○ C: 0
○ D: *i*

15. $\frac{-1+\sqrt{3}i}{2} * \frac{-1-\sqrt{3}i}{2}$ **= ?**

○ A: $\frac{-1+\sqrt{3}i}{2}$
○ B: $\frac{-1-\sqrt{3}i}{2}$
○ C: 1
○ D: 0

16. The solution for equation $x^2 - x = 2$ is?

○ A: 1 , -2
○ B: -1, 4
○ C: 2, -1
○ D: 2, -3

TEST 2

1. The degree of the equation $x^4 + 1/x^4 - 3 = 0$ is?

○ A: 4
○ B: 6
○ C: 8
○ D: None of the above.

2. $x + 2$ is a factor of ?

○ A: $x^4 + 2$
○ B: $x^4 - x^2 + 12$
○ C: $x^4 - 2x^3 - x + 2$
○ D: $x^4 + 2x^3 - x - 2$

3. If the equation $x^3 + 4x^2 - 2x + 5$ is divided by $x-1$ the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

4. $\omega^{-5} = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: None of the above.

5. The equation $\sqrt{x+3} + \sqrt{x+5} = \sqrt{3x+2}$ is called?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal equation
○ D: Square root equation.

6. The equation $2^{2x} + 4^x - 10 = 0$ is?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal
○ D: None of the above.

7. Out of the three cube roots of unit, how many are imaginary?

○ A: 1
○ B: 2
○ C: 3
○ D: Zero

8. If ω is the complex cube root of unity then $\omega = ?$

○ A: 0
○ B: 1
○ C: ω^2
○ D: ω^{-1}

9. If $x^2 + 1/x^2 = 27$, then the value of $x - 1/x$ is equal to ?

○ A: 5
○ B: 4
○ C: 3
○ D: 2

10. If the equation $x^3 + 4x^2 - 2x + 5 = 0$ is divided by $x+1$ the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

11. If one root of the equation $x^2 + px + q = 0$ is double the other, p^2/q is?

○ A: 1
○ B: 1/2
○ C: 2/9
○ D: 9/2

12. Roots of the equation $x^2 + 2x + 3 = 0$ are?

○ A: Unequal ○ B: Real

○ C: Complex ○ D: Both A & C.

13. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is?

○ A: 12 ○ B: 4

○ C: 23/6 ○ D: 49/4

14. $1/\omega$ = ?

○ A: ω ○ B: ω^2

○ C: 1 ○ D: 0

15. If the roots of $ax^2 + b = 0$ are real and distinct, then?

○ A: $ab > 0$ ○ B: $a = 0$

○ C: $a > 0$ and $b < 0$ ○ D: $ab < 0$

16. If $b^2 - 4ac$ for a quadratic equation is a perfect square the roots are?

○ A: Rational ○ B: Irrational

○ C: Complex ○ D: None of these.

17. Cube roots of 8 are?

○ A: $-2, -2w$ and $-2w^2$ ○ B: $2, 2w$ and $2w^2$

○ C: $2, w$ and w^2 ○ D: $1, w$ and w^2

18. The roots of the equation $9x^2 - 12x + 4 = 0$ are?

○ A: Equal ○ B: Complex

○ C: Irrational ○ D: Unequal

19. If j and k are the roots of the equation $2x^2 - 4x + 5 = 0$ then $(j+1)(k+1)$ = ?

○ A: 11/2 ○ B: -11/2

○ C: 2/11 ○ D: -2/11

20. $x^4 - 2x^3 + 8x^2 - 2x + 1$ is called?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal equation ○ D: None of the above.

TEST 3

1. **$(1 + w - w^2)^8$ = ? where w is cube root of unity**.

○ A: $256w^2$ ○ B: $-256w^2$

○ C: $256w$ ○ D: $-256w$

2. **For what value of m the given equation would have equal root.**

$(m + 1)x^2 + 2(m+3)x + m + 8 = 0$

○ A: ½ ○ B: 1/3

○ C: -1/3 ○ D: 2/3

3. **The number of real solutions of $|x|^2 + 3|x| + 2 = 0$ is?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 0

4. **The roots of equation $x^2 + k = 0$, $k < 0$, are?**

○ A: Complex conjugates ○ B: Real and distinct

○ C: Real and same ○ D: Rational

5. **The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is**

○ A: 2 ○ B: -2

○ C: 0 ○ D: None of these.

6. **If the roots of the equation $ax^2 + bx + c = 0$ are such that their sum is equal to the sum of their squares, then?**

○ A: $2ac = ab + b^2$ ○ B: $2ac = a^2 + b^2$

○ C: $2ac = ab + b^3$ ○ D: None of the above.

If α, β be the roots of $x^2 - 2x + 4 = 0$, $(\alpha^5 + \beta^5)$ = ?

Hint: $(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$.

○ A: 243 ○ B: 81

○ C: 64 ○ D: 32

7. **If the equation $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a common non-zero root, the value of λ is?**

○ A: -1 ○ B: 1

○ C: 3 ○ D: -3

8. **The number of real roots of $(x + 1/x)^3 + (x + 1/x) = 0$ is**

○ A: 0 ○ B: 2

○ C: 4 ○ D: 6

9. **If $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, the value of (a + b) is?**

○ A: 1 ○ B: -1

○ C: 2 ○ D: 1/2

10. **If α and β are the roots of the equation $ax^2 + bx + c$, what is equation with roots 1/α and 1/β?**

○ A: $cy^2 + by - a = 0$ ○ B: $cy^2 - by - a = 0$

○ C: $y^2 + by + a = 0$ ○ D: $cy^2 + by + a = 0$

11. If x = (3 + √ 5), the value of ($2x^3$ - $9x^2$ - 10 x + 13) is ?

○ A: 0
○ B: 1
○ C: 12 √ 5
○ D: None of the above.

12. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3$ is equal to

○ A: -1
○ B: 0
○ C: 1
○ D: 2

13. If one root of the equation $ax^2 + bx + c = 0$ is twice the other, then?

○ A: $2b^2 = 9ac$
○ B: $b^2 = 4ac$
○ C: $b^2 = 9ac$
○ D: $3b^2 = ac$

14. Only one of the root of the equation $ax^2 + bx + c = 0$, is zero, and $a \neq 0$ if,

○ A: $c = 0$
○ B: $c = 0$ and $b \neq 0$
○ C: $b = 0$ and $c = 0$
○ D: $b \neq 0$ and $c \neq 0$

15. If α and β are the roots of equation $ax^2 + bx + c = 0$ the value of $\alpha^2 + \beta^2$ is?

○ A: $\frac{b^2 + 2ca}{a^2}$
○ B: $\frac{b^2 - 2ca}{a}$
○ C: $\frac{b^2 - 2ca}{a^2}$
○ D: $\frac{b - 2ca}{a^2}$

16. If a > 0 and x = $\sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \ldots\ldots\ldots\ldots\infty}}}}$, the value of x is

○ A: $\frac{\sqrt{4a - 1}}{2}$
○ B: $\frac{1 \pm \sqrt{4a + 1}}{2}$
○ C: $\frac{-1 \pm \sqrt{4a + 1}}{2}$
○ D: $\frac{-2 \pm \sqrt{4a + 1}}{2}$

17. The roots of the equation $3^{2x+3} + 37 = 10\,(73.3^x + 1)$ are?

○ A: 2, -2
○ B: 3 , -3
○ C: 8 , 1/9
○ D: 3 , 1/3

18. Roots of the equation $x^2 + 5x - 1 = 0$ are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of the above.

19. If α + β = 4 and $\alpha^3 + \beta^3 = 44$, α, β are the roots of ?

○ A: $2x^2 - 7x + 16 = 0$
○ B: $3x^2 + 9x + 11 = 0$
○ C: $9x^2 - 27x + 20 = 0$
○ D: None of the above.

TEST 4

1. **The equation $x^5 + x^3 + 2x + 1 = 0$ has**

○ A: No positive roots ○ B: Some positive roots

○ C: No negative roots ○ D: None of the above.

2. $(-1+\sqrt{-3})^4 + (-1-\sqrt{-3})^4 = ?$

○ A: 16ω ○ B: -16

○ C: 16 ○ D: $16\omega^2$

3. **For quadratic equations, If $b^2 - 4ac$ is a perfect square then the roots are?**

○ A: Rational ○ B: Irrational

○ C: Equal ○ D: Complex

4. **The number of real roots of the equation $x^6 - 7x^3 - 8 = 0$ is?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 6

5. **If $x^3 + kx^2 -7x + 6$ is divided by x + 2, the remainder is -8. The value of k is?**

○ A: 5 ○ B: -5

○ C: 1 ○ D: -1

6. **If the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 58$ is divided by (x - 2), then the quotient must be?**

○ A: $x^3 + 5x^2 + 17$ ○ B: $x^3 + 3x + 5$

○ C: $x^3 + 7x^2 + 17x + 29$ ○ D: $x^3 + 17x + 29$

7. **If $x^3 + x^2 + x + 1 = 0$ then possible values of x are?**

○ A: 1, i, -I ○ B: -1, i^2, -i

○ C: -1, i, -I ○ D: None of the above.

8. **If x +1/x = 1 then $x^3 + 1/x^3$ is equal to**

○ A: 1 ○ B: -1

○ C: 2 ○ D: -2

9. **If two of the four roots of 625 are 5 and 5i then the other two roots are?**

○ A: -5, -5i ○ B: 5, 5i

○ C: -25, -25i ○ D: None of the above.

10. **$(x + \omega y) . (x + \omega^2 y) = ?$**

○ A: $x^2 - 2xy + y^2$ ○ B: $x^2 + 2xy + y^2$

○ C: $x^2 + xy + y^2$ ○ D: $x^2 - xy + y^2$

11. **If 5 + i be one of the roots of a given equation f(x) = 0 with real coefficients, then the lowest degree of such an equation must be?**

○ A: 2 ○ B: 3

○ C: 6 ○ D: Not enough information given to answer the question.

12. $\left(\frac{-1-\sqrt{3}i}{2}\right)^2$ = ?

○ A: $\left(\frac{-1+\sqrt{3}i}{2}\right)$

○ B: 1

○ C: $\left(\frac{-1+i}{2}\right)$

○ D: $\left(\frac{-1-i}{2}\right)$

13. If α, β are the roots of the equation $x^2 + x + 1 = 0$, the equation whose roots are α / β and β / α is?

○ A: $x^2 + x + 1 = 0$

○ B: $x^2 - x + 1 = 0$

○ C: $x^2 + x - 1 = 0$

○ D: $x^2 - x - 1 = 0$

14. $1 + \omega^4$ = ?

○ A: $1 + \omega$

○ B: $-\omega^2$

○ C: 1

○ D: Both A and B.

15. if $x + y = 7$ and $x^2 - xy + y^2 = 13$; What are the values of x and y?

○ A: (1,2) (-1,3)

○ B: (4,5) (-2,3)

○ C: (1,5) (2,5)

○ D: (4,3) (3,4)

16. An expression of the type $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 = 0$ is called

○ A: Polynomial of degree

○ B: Polynomial of degree 1

○ C: Polynomial of degree 2

○ D: Polynomial of degree n

17. If the equations $x^2 + ax + b = 0$ and $x^2 + Ax + B = 0$ have a common root say ' t ', ' t ' must be equal to?

○ A: (B - b) / (a - A)

○ B: (a - A) / (b - B)

○ C: (a + A) / (B - b)

○ D: None of the above.

18. If $2 + i\sqrt{3}$ is a root of the equation $x^2 + p x + q = 0$ (p & q being real), then p + q is equal to?

○ A: 3

○ B: -3

○ C: √3

○ D: - √3

19. The roots of the equation $12x^2 + mx + 5 = 0$ will be in the ratio 3 : 2, if m is equal to

○ A: 1/12

○ B: 5/12

○ C: 5 √ 10

○ D: 5/12 √ 10

Sequences & Series

TEST 1

1. **If a series has a common ratio between two terms. It is called?**

○ A: Geometric series.
○ B: Arithmetic series
○ C: Harmonic series
○ D: None of the above.

2. **Sum of infinite GP does not exist if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: Both B & C.

3. **Sum of infinite geometric series exists if?**

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

4. **If the sum of first n positive integers is 1/5 times the sum of their square. Then n equals?**

○ A: 5
○ B: 6
○ C: 7
○ D: 8

5. **Find next term for the series,**
1, -3, 5, -7, 9, ?

○ A: -9
○ B: -11
○ C: -13
○ D: -15

6. **If AP has a=1, $t_n = 20$ and $S_n = 399$, then the value of n is?**

○ A: 20
○ B: 32
○ C: 38
○ D: 40

7. **The 6th term of HP is 1/61 and tenth term is 1/105. The first term of HP is?**

○ A: 1/39
○ B: 1/28
○ C: 1/17
○ D: 1/6

8. **What are the number of terms in an AP if $a_1=3$, d=7 and $a_n=59$.**

○ A: 6
○ B: 7
○ C: 8
○ D: 9

9. **If first two terms of H.P are 1/2 and 1/4 then fourth term is?**

○ A: 1/6
○ B: 1/8
○ C: 1/10
○ D: 1/12

10. **Write the first four terms of the arithmetic sequence if $a_1 = 5$ and other three consecutive terms are** 23,26,29.?

○ A: 5, 10, 15, 20
○ B: 5,8,11,14
○ C: 5, 9, 13, 17
○ D: None of the above.

11. 3, 6, 12 is?

○ A: AP ○ B: GP

○ C: HP ○ D: None of the above.

12. 5th term of the GP 3, 6, 12 is?

○ A: 32 ○ B: 36

○ C: 42 ○ D: 48

13. If the first and the sixth terms of a G.P are 2 and 64, then its common ratio is?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

14. If $x = 1 + y + y^2$ .... infinity. The value of y is?

○ A: $x / (x-1)$ ○ B: $x / (1-x)$

○ C: $(x-1) / x$ ○ D: $(1-x) / x$

15. Arithmetic mean is given by formula?

○ A: $(ab)^{1/2}$ ○ B: $ab / (a + b)$

○ C: $(a + b) / 2$ ○ D: None of the above.

16. Arithmetic mean between $1 - x + x^3$ and $1 + x + x^3$ is?

○ A: $1 + x^3$ ○ B: $1 - x^3$

○ C: $1 + x$ ○ D: $1 - x$

17. nth term of GP is given by formula?

○ A: $a_n=a_1r^n$ ○ B: $a_n=a_1r^{n+1}$

○ C: $a_n=a_1r^{n-1}$ ○ D: $a_n=a_1r^{n-2}$

18. The harmonic mean of $a / (1 - ab)$ and $a / (1 + ab)$ is?

○ A: $a / (1 - ab)$ ○ B: $a / (1 - a^2b^2)$

○ C: a ○ D: $1 / (1 - a^2b^2)$

19. An infinite GP is oscillatory if?

○ A: $|r| < 1$ ○ B: $|r| > 1$

○ C: $|r| = 1$ ○ D: $|r| = -1$

20. What is the geometric mean between -2i and 8i?

○ A: ±4 ○ B: ±4i

○ C: 3i ○ D: 8i

TEST 2

1. **If the numbers a, b, c, d, e form an A.P then the value of a - 4b + 6c - 4d + e is?**

○ A: 1
○ B: 2
○ C: 0
○ D: None of the above.

2. $\sum_{k=1}^{n} k^2 = ?$

○ A: n
○ B: n(n+1) / 2
○ C: n(n+1)(2n+1) / 6
○ D: $[\, n(n+1)/2 \,]^2$

3. **If 5 is HM between 2 and b then the value of b is?**

○ A: 12.5
○ B: 10
○ C: -10
○ D: 8

4. **What is the common ratio if $a_4 = 8/27$ and $a_7 = -64/729$?**

○ A: ¼
○ B: -1/3
○ C: -2/3
○ D: -3/7

5. **If x, y, z are in A.P, then (x + 2y - z) (2y + z - x) (z + x - y) = ?**

○ A: xyz
○ B: 2xyz
○ C: 4xyz
○ D: 6xyz

6. **If | x | < 1 and $y = x + x^2 + x^3 + \dots \dots \infty$, then x is equal to?**

○ A: 0
○ B: xy
○ C: y / (1-y)
○ D: y / (1+y)

7. **The sum of the series $\sqrt{3} + 1/\sqrt{3} + 1/3\sqrt{3}$ .... ∞ is equal to ?**

○ A: √3 / 2
○ B: 3√3 / 2
○ C: 3
○ D: √3

8. **If a, b, c are in A.P as well as in G.P then?**

○ A: a = b ≠ c
○ B: a ≠ b = c
○ C: a ≠ b ≠ c
○ D: a = b = c

9. **The nth terms of the two series: 3 + 10 + 17 + ------- and 63 + 65 + 67+......... are equal. Then the value of n is?**

○ A: 9
○ B: 13
○ C: 19
○ D: 21

10. **If the quadratic equation $(b^2 + c^2)x^2 - 2(a + b)cx + (c^2 + a^2) = 0$ has equal roots, then**

○ A: a, b, c are in G.P
○ B: a, b, c are in A.P
○ C: a, c, b are in G.P
○ D: a, c, b are in A.P

The harmonic mean of the roots of the equation

11. $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + 8 + 2\sqrt{5} = 0$ is

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

12. If $a_n = (-3)\ (2/5)^n$ what the value of a_1 and r for the GP?

○ A: -6/5 and 2/5 ○ B: 6/5 and 2/5

○ C: 3/8 and 1/5 ○ D: -3/8 and 1/5

13. If in an AP $a_{25} - a_{20} = 45$, then d is equal to?

○ A: 9 ○ B: -9

○ C: 18 ○ D: 23

14. If $\frac{1}{x+y}$, $\frac{1}{2y}$, $\frac{1}{y+z}$ are in H.P, then x, y, z are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

15. For AP $T_{18} - T_8$ = ?

○ A: d ○ B: 2d

○ C: 10d ○ D: 26d

16. The value of the recurring fraction $0.0\overline{102}$ is?

○ A: 17 / 1665 ○ B: 102 / 9999

○ C: 102 / 10000 ○ D: 34 / 3339

17. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + 100^3)^{1/2} \div 100$ is?

○ A: √100 ○ B: 100

○ C: 100.5 ○ D: 50.5

18. If a, b, c, d, e, f are A.Ms (Arithmetic Means) between 2 and 12, then a + b + c + d + e + f is equal to?

○ A: 14 ○ B: 42

○ C: 64 ○ D: 82

19. The number of terms between 30 and 530, which are divisible by 11, is?

○ A: 30 ○ B: 40

○ C: 46 ○ D: 52

20. Find the sum of infinite GP 2, √2, 1 .....

○ A: $4 + \sqrt{2}$ ○ B: $2 + 2\sqrt{2}$

○ C: $4 + 2\sqrt{2}$ ○ D: $2 + 7\sqrt{2}$

TEST 3

1. If $a^x = b^y = c^z = d^t$ and a, b, c, d are in G.P then x, y, z, and t are in?

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

2. If a^2, b^2, c^2 are in A.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in

○ A: G.P ○ B: H.P

○ C: A.P ○ D: None of the above.

3. If mth term of H.P is n and nth term is m, then (m+n)th term is?

○ A: mn / (m+n) ○ B: m / (m+n)

○ C: n / (m+n) ○ D: (m-n) / (m+n)

4. If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

5. If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then a, b, c, d are in

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of these.

6. If m^{th} term of an A.P is n and n^{th} term is m, then the $(m + n)^{th}$ term is ?

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

7. If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, and $b \neq a + c$, then a, b, c are

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

8. If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} (ab)^n$, where $|a|, |b| < 1$, then

○ A: xyz = x + y + z ○ B: xy + z = xz + yz

○ C: xy + yz = xz + y ○ D: xy + xz = yz + x

9. If $a^x = b^y = c^z$ and a, b, c are in G.P then x, y, z are in?

○ A: A.P ○ B: H.P

○ C: G.P ○ D: None of the above.

10. **If a, b, c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point and that point is**

○ A: (-1. -2) ○ B: (-1, 2)

○ C: (1, -2) ○ D: (1, 2)

11. **The harmonic mean of two numbers is 4. Their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 27$, the numbers are**

○ A: 2, 15 ○ B: 9, 12

○ C: 6, 3 ○ D: 4, 8

12. **Between 1 and 31 are inserted m arithmetic means, so that the ratio of the 7th and $(m - 1)$th means is 5 : 9. Then the value of m is**

○ A: 12 ○ B: 13

○ C: 14 ○ D: 15

13. **If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to**

○ A: 75 ○ B: 430

○ C: 864 ○ D: 900

14. If the sum of an infinite G.P is 3 and the sum of the squares of its terms is also 3, then its first term and common ratio are?

○ A: 3/2, ½ ○ B: 4/7, 1/3

○ C: 1, 1/2 ○ D: 1/8, 3/8

15. **If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P., then**

○ A: p, q, r are in A.P ○ B: q^2, p^2, r^2 are in A.P

○ C: p^2, q^2, r^2 are in A.P ○ D: p, r, q are in A.P

16. **If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x \, dx$, then $I_1, I_2, I_3, \ldots\ldots$ are in**

○ A: A.P ○ B: G.P

○ C: H.P ○ D: None of the above.

17. The sum of integers from 1 to 100 which are not divisible by 3 or 5 is?

○ A: 2438 ○ B: 4745

○ C: 2317 ○ D: 2632

18. The sum of all the odd numbers of four digits which are divisible by 9 is ?

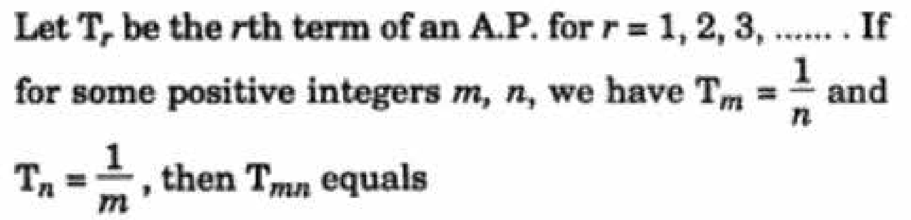
○ A: 11007000 ○ B: 4362000

○ C: 6743000 ○ D: 2754000

19. The sum of 100 terms of the series $1^2 - 2^2 + 3^2 - 4^2 + \ldots\ldots$ is?

○ A: -5050 ○ B: -4720

○ C: -3870 ○ D: -2490

20. 

Let T_r be the rth term of an A.P. for $r = 1, 2, 3, \ldots\ldots$. If for some positive integers m, n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then T_{mn} equals

○ A: 1 ○ B: 0

○ C: 1 / mn ○ D: 1/m + 1/n

TEST 4

1. $1 + 2 + 3 + 4 + \ldots\ldots n = ?$

○ A: n
○ B: n(n+1) / 2
○ C: n(n+1) / 6
○ D: n(n+1)(2n+1) / 6

2. If 5 and 8 are two AMs between a and b. What is the value of a and b?

○ A: 3, 14
○ B: 2, 11
○ C: 4, 13
○ D: 2, 16

3. If a, b, c, d, e, f are in arithmetic progression, then e - c = ?

○ A: 2(c - a)
○ B: 2(d - c)
○ C: 2(f - d)
○ D: d - c

4. If a_{n-2} term of an AP is 3n-11. What is the nth term of the sequence?

○ A: 2n – 8
○ B: 3n + 8
○ C: 3n – 5
○ D: 7n + 12

5. If $|r| < 1$ then the sum of n terms of GP are given by?

○ A: $S_n = a_1 (1 + r^n) / (1 - r)$
○ B: $S_n = a_1 (1 - r)^n / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (1 - r^n) / (1 + r)$

6. **The first term of an A.P of consecutive numbers is $p^2 + 1$. The sum of 2p + 1 terms of this series can be expressed as?**

○ A: $(p+1)^2$
○ B: $(p+1)^3$
○ C: $(2p +1) * (p+1)^2$
○ D: $p^3 + (p+1)^3$

7. The sum of first n terms of the series 1/2 + 3/4 + 7/8 + 15/16 + ... is equal to?

○ A: $2^n - n + 1$
○ B: $1 - 2^n$
○ C: $n + 2^{-n} – 1$
○ D: $2^n - 1$

8. The value of $0.4\overline{23}$ is

○ A: 419 / 999
○ B: 419 / 990
○ C: 423 / 1000
○ D: None of the above.

9. If $|r| > 1$ then the sum of n terms in a GP are given by formula?

○ A: $S_n = a_1 (r^n – 1) / (r + 1)$
○ B: $S_n = a_1 (r^n – 1) / (1 - r)$
○ C: $S_n = a_1 (1 - r^n) / (1 - r)$
○ D: $S_n = a_1 (r^n – 1) / (r - 1)$

10. Fine the 7th term of the series 2, 6, 11, 17, ...

○ A: 41
○ B: 47
○ C: 53
○ D: 62

11. Arithmetic mean between $3\sqrt{5}$ and $5\sqrt{5}$ is?

○ A: $4\sqrt{5}$
○ B: $8\sqrt{5}$
○ C: $5\sqrt{15}$
○ D: $15\sqrt{5}$

12. Harmonic mean between 3 and 7 is?

○ A: 7/3
○ B: 3/7
○ C: 21/5
○ D: 32/7

13. If k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an A.P, then k is equal to?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

14. If sum of the series $1 + \frac{3}{x} + \frac{9}{x^2} + \frac{27}{x^3} + \dots \infty$ is a finite number, then

○ A: $x < 3$
○ B: $x > 1/3$
○ C: $x < 1/3$
○ D: $x > 3$

15. If G.P consists of even number of terms and sum of all terms is equal to 5 times the sum of terms in odd places (meaning term 1, 3, 5, ...) then common ratio will be?

○ A: 3
○ B: 4
○ C: 5
○ D: 6

16. If a series has common difference between two consecutive numbers. It is called?

○ A: Geometric progression
○ B: Arithmetric progression
○ C: Harmonic progression
○ D: None of the above.

17. Which term of the AP 92, 88, 84, 80 ... is zero?

○ A: 22
○ B: 23
○ C: 24
○ D: 34

18. The angles of a triangle are in A.P. If the least angle is 30^0 the greatest angle is?

○ A: 45^0
○ B: 60^0
○ C: 75^0
○ D: 90^0

19. If a, b, c are in A.P, b - a, c - b and a are in G.P, then a : b : c is ?

○ A: 1:2:3
○ B: 1:4:9
○ C: 2:3:4
○ D: 1:2:4

20. If n arithmetic means are added between 2 and 38 and the sum of resulting series is 200. Then the value of n is?

○ A: 6
○ B: 8
○ C: 9
○ D: 10

Probability & Permutations

TEST 1

1. If there are 3 roads from Lahore to Gujranwala and 4 roads from Gujranwala to Islamabad. How many different routes are there from Lahore to Islamabad?

○ A: 4 ○ B: 10

○ C: 12 ○ D: 18

2. If ${}^nC_8 = {}^nC_{12}$, What is value of n?

○ A: 5 ○ B: 10

○ C: 20 ○ D: Cannot be determined.

3. If the probability to score a century in any given match is 0.04. How many centuries the batsmen would make in 50 matches?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

4. When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is?

○ A: 1/216 ○ B: 8/27

○ C: 130/216 ○ D: 125/216

5. A club has 20 members and you want to select the president and vice president for the club. How many different outcomes are possible if president and vice president cannot be the same person?

○ A: 370 ○ B: 380

○ C: 390 ○ D: 398

6. There are n points on a circle. The number of straight lines obtained by joining them is?

○ A: ${}^nC_3$ ○ B: ${}^nC_2$

○ C: ${}^nC_2 - n$ ○ D: ${}^nC_n$

7. Probability of occurance for one of the four equally likely events would be?

○ A: 0 ○ B: 0.25

○ C: 0.75 ○ D: 1

8. What is the probability of getting a sum 9 from two throws of a dice?

○ A: 1/6 ○ B: 1/8

○ C: 1/9 ○ D: 1/12

9. The number of ways of painting the faces of a cube with six different colours is?

○ A: 1 ○ B: 6

○ C: 6! ○ D: None of the above.

10. Which of the following is true?

n! = n(n-1)!, 0! = 0, 4! = 4.3.2.1

○ A: iii only ○ B: i and ii only

○ C: i and iii only ○ D: i, ii and iii

11. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

○ A: 5/7 ○ B: 2/7

○ C: 3/5 ○ D: 2/5

12. A husband and a wife appear in an interview for the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that none of them will be selected?

○ A: 12/35 ○ B: 34/35

○ C: 24/35 ○ D: None of the above.

13. If you role a dice twice. What is the probability that you would get 6 both the times?

○ A: 1/3 ○ B: 1/6

○ C: 1/12 ○ D: 1/36

14. If A and B are two independent sets then P(A∩B) = ?

○ A: P(A) + P(B) ○ B: P(A) * P(B)

○ C: P(A) + P(B) – P(AᴜB) ○ D: P(A)

15. The number of diagonals of a hexagon is?

○ A: 6 ○ B: 9

○ C: 15 ○ D: 18

16. The number of ways of selecting 2 candidates out of 5 equally qualified candidates for a post is?

○ A: 10 ○ B: 8

○ C: 5 ○ D: 20

17. P, Q, R and S are to give lectures to an audience. The organizer can arrange the order of their presentations in how many ways?

○ A: 4 ○ B: 8

○ C: 12 ○ D: 24

18. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: (p+q)! ○ B: (p+q)! / p!

○ C: (p+q)! / q! ○ D: (p+q)! / p!q!

19. A set with all possible outcomes of an experiment is called?

○ A: Probability function ○ B: Event space

○ C: Sample space ○ D: Both B and C.

20. 9! / (6!3!) = ?

○ A: 72 ○ B: 84

○ C: 96 ○ D: 108

TEST 2

1. **The total number of different combinations of names which can be made from the letters of the word MISSISSIPPI, using all the letters at a time?**

○ A: 4!x 4!x 2! ○ B: 11! / (4!x 4!x 2!)

○ C: 11! / (10!) ○ D: 11!

2. **A work is given to 3 men and their probabilities for doing the work are 1/7, 1/4, 1/6 respectively. Find the probability that the work is done?**

○ A: 39/84 ○ B: 1/168

○ C: 167/168 ○ D: 23/89

3. **Three identical dice are rolled. The probability that the same number will appear on each of them is?**

○ A: 1/6 ○ B: 1/36

○ C: 1/216 ○ D: 3/216

4. **The number of subsets of a set containing n distinct objects is?**

○ A: ${}^nC_1 + {}^nC_2 + {}^nC_3 + ... + {}^nC_n$ ○ B: ${}^nC_0 + {}^nC_1 + {}^nC_2 +..... + {}^nC_n$

○ C: $2^n + 1$ ○ D: None of the above.

5. **The odds against drawing 2 red balls from a bag containing 3 red and 2 white balls is?**

○ A: 1 : 2 ○ B: 3 : 7

○ C: 7 : 3 ○ D: 3 : 2

6. **Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that either Hafeez or Afridi would face the first ball?**

○ A: 2/11 ○ B: 1/11

○ C: 1/121 ○ D: 1/110

7. **There are 8 persons in the room. 4 are men and 4 are women. If two persons are selected, what is the probability that both of them would be men?**

○ A: ½ ○ B: 1/4

○ C: 3/7 ○ D: 3/14

8. **In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is?**

○ A: 21/46 ○ B: 25/117

○ C: 1/50 ○ D: 3/23

9. **Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that neither Hafeez nor Afridi would face the first ball?**

○ A: 2/11 ○ B: 1/11

○ C: 9/11 ○ D: 10/11

10. **An rack has 5 black and 4 white ties. A boy pulls out 2 ties at random. The probability that 2 are of the same colour is?**

○ A: 4/9 ○ B: 5/9

○ C: 5/8 ○ D: 3/8

11. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

○ A: 1/14
○ B: 1/8
○ C: ¾
○ D: 4/7

12. For any two events A and B, $P(A \cap B)$ is?

○ A: Less than $P(A) + P(B) – 1$
○ B: Greater than $P(A) + P(B)$
○ C: $P(A) + P(B) - P(A \cup B)$
○ D: $P(A) + P(B) + P(A \cup B)$

13. The probability that a man will live 10 more years is 1/4 and the probability that his wife will live 10 more years is 1/3. The probability that neither of them will be alive in 10 years is?

○ A: 1/12
○ B: 11/12
○ C: 7/12
○ D: 1/2

14. A box contains 2 white, 3 black and 4 red balls. The number of ways in which 3 balls can be drawn from the box, so that at least one of the balls is black is?

○ A: 45
○ B: 84
○ C: 64
○ D: 32

15. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

○ A: 10/21
○ B: 11/21
○ C: 2/7
○ D: 5/7

16. The chances of wining of two race horses are 1/3 and 1/6 respectively. What is the probability that atleast one will win, when the horses are running in different races?

○ A: ½
○ B: 1/8
○ C: 1/18
○ D: 4/9

17. How many signal can be made with 4 signs using any number of signs at a time?

○ A: 24
○ B: 60
○ C: 64
○ D: 82

18. How many words can be formed by taking four different letters of the word MATHEMATICS?

○ A: 7920
○ B: 1680
○ C: 1260
○ D: 68

19. $^{n}P_{r}$ = ?

○ A: $^{n}C_{r} * r!$
○ B: $^{n}C_{n-r} * r!$
○ C: $^{n}C_{n-r}$
○ D: Both A and B.

20. If the probability that a batsmen scores a century in any given match is 0.3. On average how many matches the batsmen would play to score his first century?

○ A: 2
○ B: 4
○ C: 15
○ D: 30

TEST 3

1. **A matrix is chosen at random from the set of all 2 x 2 matrices with elements 0 and 1 only. The probability that the value of the determinant of the matrix chosen is positive is?**

   ○ A: 1/8 ○ B: 3/16

   ○ C: 1/16 ○ D: 13/16

2. **Six identical coins are arranged in a row. The number of ways, in which the number of tails is equal to the number of heads is?**

   ○ A: 20 ○ B: 24

   ○ C: 36 ○ D: 48

3. **3 books of english and 5 books of urdu are randomly placed on a shelve. What is the probability that books on the same subject are together?**

   ○ A: 1/56 ○ B: 1/7

   ○ C: 2/8! ○ D: 1/28

4. **When a dice is rolled probability that even number or number greater than 4 appear is?**

   ○ A: 5/6 ○ B: 1/6

   ○ C: 2/3 ○ D: 1/3

5. **There are 10 lamps of different colors in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is?**

   ○ A: 1025 ○ B: 1024

   ○ C: 1023 ○ D: 10!

6. **Eight chairs are numbered 1 to 8. 2 women and 3 men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is?**

   ○ A: ${}^4C_3 \cdot {}^4C_2$ ○ B: ${}^4C_2 \cdot {}^4P_2$

   ○ C: ${}^4P_2 \cdot {}^4P_3$ ○ D: ${}^4P_2 \cdot {}^6P_3$

7. **Find the number of ways in which a mixed double tennis game can be arranged between 10 players consisting of 6 men and 4 women?**

   ○ A: 190 ○ B: 180

   ○ C: 90 ○ D: 48

8. **There are 18 children in the room including 9 boys and 9 girls. You call a child to give a sweet and the child goes back to the room and can potentially be chosen again. If total number of sweets are 4, what is the probability that atleast one boy gets the sweet?**

   ○ A: 1/16 ○ B: 15/16

   ○ C: 9/16 ○ D: 7/18

9. **If five digit numbers are formed from 1,2,3,4,8. What is the probability of forming a number with 2 and 8 not next to each other?**

   ○ A: 2/5 ○ B: 2/7

   ○ C: 5/7 ○ D: 3/5

10. **In how many ways 8 books including 2 English books can be arranged together such that English books are not together?**

   ○ A: 5040 ○ B: 10080

   ○ C: 30240 ○ D: 40320

A person wishes to make up as many different parties as he can out of his 20 friends, such that each party consists of the same number of persons. The number of friends he should invite at a time is?

○ A: 5 ○ B: 8

○ C: 10 ○ D: 12

11. Pakistan plays two matches each with West Indies and Australia. In any match, the probabilities of Pakistan getting points 0, 1 and 2 are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of Pakistan getting at least 7 points is?

○ A: 0.8750 ○ B: 0.0875

○ C: 0.0625 ○ D: 0.0250

12. In how many ways 5 boys and 4 girls can be seated in a bench such that boys and girls occupy alternate seats?

○ A: 1240 ○ B: 1560

○ C: 2590 ○ D: 2880

13. A man invites 4 men and 4 women to a party. In how many ways can they sit around a round table, so that no two men are together?

○ A: 6 ○ B: 24

○ C: 132 ○ D: 144

14. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:?

○ A: 3/22 ○ B: 1/22

○ C: 2/91 ○ D: 3/91

15. Two different numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is? Hint: $a^2 - b^2$ is divisible by 3 if both the numbers are divisible by 3 or none of them is divisible by 3.

○ A: 2/87 ○ B: 19/87

○ C: 37/87 ○ D: 47/87

16. $^{13}C_9 - {}^{12}C_8$ is equal to?

○ A: $^{13}C_7$ ○ B: $^{13}C_9$

○ C: $^{12}C_9$ ○ D: None of the above.

17. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 points lying on them respectively. The number of triangles that can be constructed using these points as vertices is?

○ A: 205 ○ B: 208

○ C: 220 ○ D: 260

18. If A and B are two events, such that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\overline{B})=1/2$, then the events A and B are?

○ A: Independent ○ B: Dependent

○ C: Disjoint ○ D: None of the above.

19. How many necklaces can be made from 6 beads of different colors?

○ A: 60 ○ B: 120

○ C: 360 ○ D: 720

TEST 4

1. A carton contains 20 bulbs, out of which 5 are defective. If a sample of 3 bulbs is selected at random, find the probability that 2 of them are defective bulbs?

○ A: 1/16 ○ B: 3/64

○ C: 9/64 ○ D: 2/64

2. The number of ways in which 12 balls can be divided between two friends, one receiving 8 and the other 4 is?

○ A: 12! / 8!4! ○ B: 12!2! / 8!4!

○ C: 12! / 8!4!2! ○ D: 8!4!

3. The probability that A can solve a problem is 2/3 and the probability that B can solve the problem is 3/4. The probability that at least one of A and B will be able to solve the problem is?

○ A: 11/12 ○ B: 5/12

○ C: 1/12 ○ D: 1/2

4. Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 1 heads after six tosses?

○ A: 0.08 ○ B: 0.17

○ C: 0.30 ○ D: 0.44

5. How many 5 digit number divisible by 2 can be formed from 1,2,3,5,7?

○ A: 24 ○ B: 48

○ C: 124 ○ D: 132

6. Out of 40 consecutive integers, two are chosen at random. The probability that their sum is odd is?

○ A: 1/200 ○ B: 1/2

○ C: 20/39 ○ D: 1/20

7. Cards are drawn one by one at random from a well shuffled pack of 52 cards. What is the probability that there is only one ace in first 17 cards?

○ A: $({}^{4}C_1 * {}^{48}C_{16}) / {}^{52}C_{17}$ ○ B: ${}^{48}C_{16} / {}^{52}C_{17}$

○ C: $({}^{4}C_1 + {}^{48}C_{16}) / {}^{52}C_{17}$ ○ D: ${}^{4}C_1 / {}^{52}C_{17}$

8. H.C.F of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: None of the above.

9. The number of arrangements which can be made using all the letters of the word LAUGH, if the vowels are adjacent is?

○ A: 120 ○ B: 24

○ C: 48 ○ D: 56

10. On the occasion of Eid festival, each student of a class sends greeting cards to others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is?

○ A: ${}^{20}C_2$ ○ B: $2 \times {}^{20}C_2$

○ C: $2\ {}^{20}P_2 - 1$ ○ D: None of the above.

11. There are 4 letter boxes in a post office. In how many ways can a man post 8 different letters?

○ A: 4^8 ○ B: 8^4

○ C: 8! ○ D: 4!

12. 5 men and 6 women have to be seated in a straight row, so that no two women are together. Find the number of ways in which this can be done?

○ A: 43200 ○ B: 39600

○ C: 36000 ○ D: 86400

13. The number of ways in which 5 beads of different colours can form a necklace is?

○ A: 6 ○ B: 12

○ C: 24 ○ D: 60

14. L.C.M. of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: n

15. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

○ A: ¾ ○ B: 1/3

○ C: 7/19 ○ D: 9/21

16. $^{n}P_{n}$ = ?

○ A: $^{n}C_{n}$ ○ B: $^{n+1}C_{n}$

○ C: n ○ D: n!

17. Everybody in a room shakes hand with every other person. The total number of hand shakes is 66. Find the total number of persons in the room?

○ A: 9 ○ B: 10

○ C: 11 ○ D: 12

18. A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 1/3, 1/4 respectively. What is the probability that the problem will be solved?

○ A: ¼ ○ B: 1/24

○ C: 7/24 ○ D: 3/4

19. The number of ways in which a mixed double game can be arranged from among nine married couples, if no husband and wife play in the same game is?

○ A: 1512 ○ B: 756

○ C: 3024 ○ D: 3298

20. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: C(p + q, q) ○ B: P(p + q, p)

○ C: P(p + q, q) ○ D: C(p + q, p - q)

21. If you toss four coins, what is the probability of getting two heads and two tails?

○ A: 3/16 ○ B: 1/8

○ C: 2/8 ○ D: 3/8

22. When three dice are thrown, what is the probability of getting the same number on three of them?

○ A: 1/216 ○ B: 1/36

○ C: 5/36 ○ D: 1/6

23. The number of digits that can be formed from 2, 3, 5, 7, 8 with 2 and 8 next to each other is?

○ A: 24 ○ B: 36

○ C: 48 ○ D: 72

24. An employer wants to hire 3 analysts from 6 applicants and 2 designers from 4 applicants. What is the total number of ways in which she can make the selection?

○ A: 1490 ○ B: 132

○ C: 120 ○ D: 60

25. If ${}^{n}C_{r-1} = 36$, ${}^{n}C_{r} = 84$ and ${}^{n}C_{r+1} = 126$, then r is equal to?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

26. Four cars are racing in a circuit. What are the total number of permutations with which they can cross the finish line?

○ A: 4 ○ B: 16

○ C: 18 ○ D: 24

27. The probability that the 1st day of a random chosen month is a Friday is?

○ A: 1/7 ○ B: 1/12

○ C: 1/19 ○ D: 1/84

28. m parallel lines in a plane are intersected by a family of n parallel lines. The total number of parallelograms so formed is?

○ A: (m-1)(n-1) / 4 ○ B: mn/4

○ C: m(m-1)(n-1)/2 ○ D: mn(m-1)(n-1)/4

29. There are 10 girls and 20 boys in a class. 5 girls and 10 boys have blue eyes. Find the probability that one student chosen at random is a girl and has blue eyes?

○ A: 2/3 ○ B: 5/6

○ C: 1/6 ○ D: 1/2

30. If $P(A \cup B) \neq P(A) + P(B)$ Then;

○ A: A and B are disjoint sets. ○ B: A and B are Independent sets

○ C: A and B are overlapping sets ○ D: A and B are unit event sets.

31. From a set of 17 cards numbered 1 to 17, one card is drawn at random. The probability that the number is divisible by 3 or 7 is?

○ A: 2/17 ○ B: 5/17

○ C: 7/17 ○ D: 9/17

32. The number of times the digit 3 will appear listing the integers from 1 to 1000 is?

○ A: 271 ○ B: 280

○ C: 297 ○ D: 300

33. Three unbiased coins are tossed. What is the probability of getting atleast one head?

○ A: ¾ ○ B: 1/4

○ C: 1/8 ○ D: 7/8

Induction & Binomial Theorem

TEST 1

1. **Which of the following is not true regarding the binomial expansion of $(a + x)^n$?**
   - ○ A: Total number of terms is n + 1.
   - ○ B: Sum of exponents of a and x in each term of expansion is equal to n.
   - ○ C: Exponent of a decrease from n to n - 1.
   - ○ D: Exponent of x increase from 0 to n.

2. **What is the coefficient of the third term for $(x + y)^5$?**
   - ○ A: 2
   - ○ B: 5
   - ○ C: 8
   - ○ D: 10

3. **What is the general term of $(x + 2/x)^4$?**
   - ○ A: $C(4,k)\ 2^k\ x^{4-2k}$
   - ○ B: $C(4,k)\ 2^k\ x^{2-2k}$
   - ○ C: $C(4,k)\ 2^k\ x^{4-k}$
   - ○ D: $C(4,k)\ 2^{2k}\ x^{2-2k}$

4. **$(x+y)^4 = ?$**
   - ○ A: $x^4 + 2x^3y + 4x^2y^2 + 2xy^3 + y^4$
   - ○ B: $x^4 + 4x^3y + 6x^2y^2 + 2xy^3 + y^4$
   - ○ C: $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$
   - ○ D: $x^4 + 4x^3y + 8x^2y^2 + 4xy^3 + y^4$

5. **If n is odd, the middle term in the expansion of $(a + x)^n$ is?**
   - ○ A: n/2 + 1
   - ○ B: n/2 and n/2 + 1
   - ○ C: (n + 1) / 2 and (n + 2) / 2
   - ○ D: (n + 1) / 2 and (n + 3) / 2

TEST 2

1. **The method of mathematical induction was devised by?**

   ○ A: David Hilbert ○ B: Francesco Mourolico

   ○ C: Issac Newton ○ D: Carl F. Gauss

2. **What is the 3rd term in the binomial expansion of**

3. $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^6$

   ○ A: -20 ○ B: 20

   ○ C: 15 a/x ○ D: 15 x/a

4. **Third term in the expansion of $(1 - x)^{-1}$ is?**

   ○ A: x^2 ○ B: $2x^2$

   ○ C: $-x^2$ ○ D: $-2x^2$

5. **Which of the following would have even number of terms in its expansion?**

   ○ A: $(a + x)^{20}$ ○ B: $(a + x)^{90}$

   ○ C: $(a + x)^{51}$ ○ D: Both A and B.

6. **What is the value of $(0.97)^6$ using only the first three terms of binomial expansion?**

   ○ A: 0.8246 ○ B: 0.8318

   ○ C: 0.8335 ○ D: 0.8452

7. **How many terms are there in the expansion of $(a + x)^{100}$**

   ○ A: 99 ○ B: 100

   ○ C: 101 ○ D: Cannot determine.

8. **What is the middle term in the expansion of $(4x – y)^8$?**

   ○ A: 19240 x^4y^4 ○ B: 17920 x^4y^4

   ○ C: 56220 x^2y^2 ○ D: 18420 x^4y^4

9. **What is the contant term in the expansion of $(1/z^3 + z^2)^5$?**

   ○ A: 10 ○ B: 16

   ○ C: 18 ○ D: 24

10. **What is the fourth term in the expansion of $(1 - x)^{1/2}$?**

   ○ A: - ¼ ○ B: - 1/2 x

   ○ C: -1/8 x^2 ○ D: - 1/16 x^3

TEST 3

1. For which x the 5th expansion member equals $M_5 = 105$?

$$\left(\frac{1}{2\sqrt{x}} - \frac{1}{2}\right)^{10}$$

○ A: ½
○ B: 1/4
○ C: 1/8
○ D: 2

2. If x is the sum of the odd coefficients and y is the sum of the even coefficients in a binomial expansion. Then?

○ A: $x = y/2$
○ B: $x = y$
○ C: $x = 2y$
○ D: None of the above.

3. The rule of binomial expansion for $(a + x)^n$ is valid if?

○ A: a and x both are real numbers.
○ B: a is real and x can be real or complex.
○ C: x is real and a can be real or complex.
○ D: Both a and x can be real or complex.

4. Find out the member of the binomial expansion of $(x + x^{-1})^8$ not containing x?

○ A: 7th
○ B: 6th
○ C: 5th
○ D: 4th

5. If in the expansion of $(x + y^3)^n$ the coefficient of the 3rd term is greater by 44 than the 2nd term. The value of n is?

○ A: 8
○ B: 9
○ C: 10
○ D: 11

6. Which term in the expansion of $(x - 2/x^2)^{13}$ has term x^{-2} ?

○ A: 5th
○ B: 6th
○ C: 7th
○ D: 8th

7. The sum of coefficients in the binomial expansion is equal to?

○ A: 2^n
○ B: 2^{2n}
○ C: 2^{2n-1}
○ D: 2^{n-1}

8. What is the middle term in the expansion of $(x + 1/x)^{2n}$? Where $x \neq 0$.

○ A: C(2n,n)
○ B: C(2n,n) x
○ C: C(2n,n) x^{2n}
○ D: C(2n,n) x^{3n}

9. What is the constant term in the expansion of $(x^2 - 2/x^2)^8$?

○ A: 1080
○ B: 1120
○ C: 2400
○ D: 2480

10. Which member of the binomial expansion of $(2x^3 + x^{-1})^{10}$contains x^6?

○ A: 6th
○ B: 7th
○ C: 8th
○ D: 9th

11. What is the term containing x^{14} in the expansion of $(x^3 - 1/x^2)^{13}$?

○ A: C(13,7) $12x^{14}$
○ B: -C(13,6) $10x^{14}$
○ C: -C(13,5) x^{14}
○ D: C(13,8) $4x^{14}$

Trigonometry

TEST 1

1. 235° expressed in radians is?

○ A: π / 235
○ B: 85π / 49
○ C: 47π / 36
○ D: 235/π

2. 1/2 rotation anti-clockwise is called?

○ A: Right angle
○ B: Straight Angle
○ C: Circle
○ D: None of the above.

3. If $5\sin\theta = 3$, $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to

○ A: ½
○ B: 1
○ C: 2
○ D: 4

4. If $\cos 3\theta = \sqrt{3}/2$; $0 < \theta < 20^o$ then the value of θ is?

○ A: 0°
○ B: 5°
○ C: 10°
○ D: 15°

5. If sec θ - tan θ = 1/2 then sec θ + tan θ = ?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. cos A - cos B = ?

○ A: 2 cos (A+B)/2 cos (A-B)/2
○ B: 2 cos (A+B)/2 sin (A-B)/2
○ C: 2 sin (A+B)/2 cos (A-B)/2
○ D: -2 sin (A+B)/2 sin (A-B)/2

7. Which of the following is not ture?

○ A: cot (-θ) = - cot θ
○ B: cos (-θ) = cos θ
○ C: sin (-θ) = - sin θ
○ D: tan (-θ) = tan (θ)

8. $\sin 30^0 + \cos 60^0 + \tan 45^0$ is equal to?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

9. In sexagesimal system angle is represented in?

○ A: Degrees
○ B: Degrees, Minutes and Seconds
○ C: Radians
○ D: Mircro radians.

10. If sin θ = cos θ then θ = ?

○ A: 30°
○ B: 45°
○ C: 60°
○ D: 75°

11. If the length of arc is twice the radius of the circle. Then angle subtended at the center is?

○ A: 1 radian
○ B: 2 radian
○ C: π/3 radian
○ D: π/4 radian

12. What is the period of tan 4x?

○ A: π
○ B: π/3
○ C: π/4
○ D: π/8

13. $\tan^2 x - \sin^2 x$ is equal to?

○ A: $\tan^2 x \operatorname{cosec}^2 x$
○ B: $\sin^2 x \cot^2 x$
○ C: $\sec^2 x \operatorname{cosec}^2 x$
○ D: $\tan^2 x \sin^2 x$

14. tan 225° =?

○ A: 0
○ B: 1
○ C: √3
○ D: 1/√3

15. tan (2π - θ) = ?

○ A: tan θ
○ B: - tan θ
○ C: cot θ
○ D: - cot θ

16. If cos A = 1/√2 and sin B = 1/2 then A+B = ?

○ A: 60°
○ B: 75°
○ C: 90°
○ D: 120°

17. 1° = ?

○ A: 0.0125 radian
○ B: 0.0175 radian
○ C: 0.0225 radian
○ D: 0.0275 radian

18. 35° 20' in radians is?

○ A: 28π / 220
○ B: 53π / 45
○ C: 53π / 290
○ D: 53π / 270

19. cos (π + θ) = ?

○ A: sin θ
○ B: - sin θ
○ C: cos θ
○ D: - cos θ

20. If A = B = 60°. Then $\dfrac{cscA + cotB}{secA * tanB}$ = ?

○ A: 0
○ B: 1
○ C: ½
○ D: 1/√2

TEST 2

1. Which of the following relations is possible?

○ A: sec θ = 2/3
○ B: sin θ = 4/3
○ C: tan θ = 2014
○ D: cos θ = $(1+t^2) / (1-t^2)$

2. sec (-960°) = ?

○ A: 2
○ B: √2
○ C: -√2
○ D: -2

3. cos 2α = ?

○ A: sin α cos α
○ B: 2 sin α cos α
○ C: $\cos^2 \alpha - \sin^2\alpha$
○ D: $\cos^2 \alpha + \sin^2\alpha$

4. If α, β and γ are the angles of a triangle then $\sin(\alpha + \beta) = ?$

○ A: $\sin \gamma$

○ B: $\cos \gamma$

○ C: $-\sin \gamma$

○ D: $-\cos \gamma$

5. $\sin(-625^\circ) = ?$

○ A: $\sin 5^\circ$

○ B: $\cos 5^\circ$

○ C: $\sin 15^\circ$

○ D: $\cos 15^\circ$

6. Converting 21.256° to DMS gives?

○ A: $21^\circ\ 15.36'$

○ B: $21^\circ\ 18'\ 32''$

○ C: $21^\circ\ 15'\ 22''$

○ D: $21^\circ\ 15'\ 28''$

7. If $\sin(A + B + C) = 1$, $\tan(A - B) = 1/\sqrt{3}$, and $\sec(A + C) = 2$, then?

○ A: $A = 120^\circ$, $B = 60^\circ$ and $C = 0^\circ$

○ B: $A = 60^\circ$, $B = 30^\circ$ and $C = 0^\circ$

○ C: $A = 60^\circ$, $B = 60^\circ$ and $C = 60^\circ$

○ D: $A = 90^\circ$, $B = 60^\circ$ and $C = 30^\circ$

8. $\sin A + \sin B = ?$

○ A: $-2 \sin (A+B)/2 \sin (A-B)/2$

○ B: $2 \cos (A+B)/2 \cos (A-B)/2$

○ C: $2 \sin (A+B)/2 \cos (A-B)/2$

○ D: $2 \cos (A+B)/2 \sin (A-B)/2$

9. The value of $\tan 15^\circ + \cot 15^\circ$ is ?

○ A: 1

○ B: $\sqrt{3}$

○ C: $\sqrt{3}/2$

○ D: 4

10. The period of the function $f(x) = \cos 4x$ is?

○ A: π

○ B: 2π

○ C: $\pi/2$

○ D: $3\pi/2$

11. If $x = \sin^2 \theta \cos \theta$ and $y = \cos^2 \theta \sin \theta$ then $\sin \theta = ?$

○ A: x^2 / y

○ B: y^2 / x

○ C: $(y^2 / x)^{1/3}$

○ D: $(x^2 / y)^{1/3}$

12. What is the period of $\cot x/7$?

○ A: 7π

○ B: $2\pi/7$

○ C: $\pi/7$

○ D: $\pi/14$

13. If $\cot \theta = \sin 2\theta$, then θ is equal to?

○ A: 45° and 90°

○ B: 45° and 90°

○ C: 90° and 60°

○ D: 60° and 30°

14. The value of $\cos^2 15^\circ - \cos^2 30^\circ + \cos^2 45^\circ - \cos^2 60^\circ + \cos^2 75^\circ$ is?

○ A: 1

○ B: 1/2

○ C: 3/2

○ D: 2

15. If $\tan \theta = 8/15$ then what is the value of $\sec \theta$ for θ lying in the quadrant III?

○ A: 15/17

○ B: -15/17

○ C: 17/15

○ D: - 17/15

16. The largest value of $\sin\theta \times \cos\theta$ is?

○ A: 1

○ B: 1/2

○ C: $1/\sqrt{2}$

○ D: $1/\sqrt{3}$

17. $(1 + \sec\theta)(1 - \cos\theta) = ?$

○ A: $\sin\theta$ ○ B: $\cot\theta$

○ C: $\cot\theta \cos\theta$ ○ D: $\tan\theta \sin\theta$

18. $\sec(-7\pi/4) = ?$

○ A: $\sqrt{2}$ ○ B: $-\sqrt{2}$

○ C: $2/\sqrt{3}$ ○ D: $-2/\sqrt{3}$

19. If the length of a chord of a circle is equal to the radius of that circle, the angle subtended (in radians) at the centre of the circle by the chord is?

○ A: 1 ○ B: $\pi/2$

○ C: $\pi/3$ ○ D: $\pi/6$

20. The value of $\cos 1° * \cos 2° * \cos 3° \ldots\ldots \cos 179°$ is ?

○ A: 0 ○ B: 1

○ C: 2 ○ D: -1

TEST 3

1. The perimeter of a certain sector of a circle is equal to half that of the circle of which it is a part. The circular measure of the angle of the sector is?

○ A: π ○ B: $\pi - 2$

○ C: $2\pi/3$ ○ D: $\pi - 4$

2. $\tan 3x - \tan 2x - \tan x$ is equal to?

○ A: $\tan x / (\tan 2x * \tan 3x)$ ○ B: $(\tan x)^3$

○ C: $(\tan 3x + \tan 2x + \tan x) - (\tan x * \tan 2x)$

○ D: $\tan x * \tan 2x * \tan 3x$

3. $\sin 75^o = ?$

○ A: $\dfrac{\sqrt{2}(\sqrt{3}+1)}{4}$ ○ B: $\dfrac{\sqrt{2}(\sqrt{3}-1)}{4}$

○ C: $\sqrt{3}/4$ ○ D: $-\sqrt{3}/4$

4. The equation $\sin x \cos x = 2$ has?

○ A: One solution ○ B: Two solutions

○ C: Infinite solutions. ○ D: No solution.

5. $\cos(x+y)\sin(x-y) = ?$

○ A: $1/2 (\sin 2x - \sin 2y)$ ○ B: $1/2 (\sin 2y - \sin 2x)$

○ C: $\sin 2x - \sin 2y$ ○ D: $\sin 2x + \sin 2y$

6. $\tan(294^o) = ?$

○ A: $\cot 32^o$ ○ B: $-\cot 32^o$

○ C: $-\cot 24^o$ ○ D: $\cot 24^o$

7. If $\sin A + \sin B = x$ and $\cos A + \cos B = y$, $\cos(A - B)$ is equal to ?

○ A: $x^2 + y^2 - 2$ ○ B: $(x^2 + y^2 - 2) / 2$

○ C: $(2 - x^2 + y^2) / 2$ ○ D: $(2 - x^2 - y^2) / 2$

8. Period of cot (3x) - sin (4x) is?

○ A: πq
○ B: π/2
○ C: π/3
○ D: π/4

9. $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = ?$

○ A: 1
○ B: 2
○ C: tan 2θ
○ D: cot 2θ

10. (1 - cos α) / sin α = ?

○ A: cos α/2
○ B: sin α/2
○ C: sec α/2
○ D: tan α/2

11. 8 sin x/8 cos x/2 cos x/4 cos x/8 = ?

○ A: 4 sin x
○ B: sin x
○ C: cos x
○ D: 8 cos x

12. What is the domain of $\sqrt{\sin^{-1} 2x + \pi/6}$ **?**

○ A: [1/4 , 1/2]
○ B: [-1/4 , 1/2]
○ C: [1/8 , 1/2]
○ D: [-1/8 , 1/2]

13. cos 12° + cos 48° = ?

○ A: 2 cos 30° cos 18°
○ B: - 2 cos 30° cos 18°
○ C: 2 cos 30° sin 18°
○ D: - 2 cos 30° sin 18°

14. If $(x \sin^3 \alpha + y \cos^3 \alpha) = \sin \alpha \cos \alpha$ and $(x \sin \alpha - y \cos \alpha = 0)$, then $x^2 + y^2 = ?$

○ A: 0
○ B: 2
○ C: -1
○ D: 1

15. If $\sin^2\theta + 3 \cos\theta - 2 = 0$, $\cos^3\theta + \sec^3\theta$ is equal to?

○ A: 18
○ B: 9
○ C: 6
○ D: 3

16. The value of tan 1° * tan 2° * tan 3° ...... tan 89° = ?

○ A: 0
○ B: 1
○ C: -1
○ D: 1/2

17. If cos (A - B) = 3/5 and tan A . tan B = 2 then ?

○ A: cos A cos B = 1/5
○ B: sin A sin B = -2/5
○ C: cos (A + B) = 1/5
○ D: sin A sin B =4/5

18. sin 2α / (1 + cos 2α) = ?

○ A: cot α
○ B: tan α
○ C: sec α
○ D: csc α

19. Find the value of $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$

○ A: tan 3θ
○ B: cot 3θ
○ C: tan 6θ
○ D: cot 6θ

20. $\dfrac{tan\ \alpha + tan\ \beta}{tan\ \alpha - tan\ \beta} = ?$

○ A: sin (α + β) / sin (α - β) ○ B: sin (α - β) / sin (α + β)

○ C: cot (α + β) ○ D: sin α / sin (α - β)

TEST 4

1. **tan (15°) = ?**

○ A: (√3 + 1) / (√3 - 1) ○ B: (√3 - 1) / (√3 + 1)

○ C: √3 / (√3 + 1) ○ D: 1/3√3

2. **The bottom of a pendulum describes an arc 3 ft long when the pendulum swings through an angle of 1/5 radian. The length of the pendulum in feet is ?**

○ A: 15 ft ○ B: 12 ft

○ C: 5/3 ft ○ D: 3/5 ft

3. **tan (π/4 + θ) tan (3π/4 + θ) is equal to ?**

○ A: 0 ○ B: 1

○ C: -1 ○ D: 2

4. **If tan 2 A = cot (A - 18°), then the value of A is?**

○ A: 18° ○ B: 24°

○ C: 27° ○ D: 36°

5. **What is the period of sec 9x ?**

○ A: π ○ B: 2π/9

○ C: π/9 ○ D: π/18

6. **If cot θ > 0 and sin θ < 0 then θ lies in the ?**

○ A: Quadrant I ○ B: Quadrant II

○ C: Quadrant III ○ D: Quadrant IV

7. **If α, β and γ are the angles of a triangle then tan (α + β) - tan γ = ?**

○ A: 2 tan γ ○ B: - 2 tan γ

○ C: 0 ○ D: 1

8. **1 radian = ?**

○ A: 60° ○ B: 59°

○ C: 58° ○ D: 57°

9. **6'' in radians = ?**

○ A: π / 216000 radians ○ B: π / 108000 radians

○ C: π / 648000 radians ○ D: π / 3600 radians

10. **The radius of a circle is 8 in. Find the angle in radians that an arc of 1 ft subtends in the center of this circle?**

○ A: 1/8 ○ B: 2/8

○ C: 3/2 ○ D: π/6

11. In a triangle ABC, A = 45°, then the value of (1 + cot B) (1 + cot C) is equal to ?

○ A: 0
○ B: 1
○ C: -1
○ D: 2

12. If $\tan\theta = -4/3$, $\sin\theta$ = ?

○ A: -4/5 but not 4/5
○ B: 4/5 but not -4/5
○ C: 4/5 or - 4/5
○ D: Undefined.

13. Which of the following is true for $0^o \le \theta < 90^o$?

○ A: $1/\sec\theta > 1$
○ B: $1/\operatorname{cosec}\theta < 1$
○ C: $\sec\theta = 0$
○ D: $1/\cos\theta < 1$

14. Which of the following is true about θ in the quadrant II?

csc θ is positive, cos θ is positive, tan θ is positive

○ A: i only
○ B: i and ii only
○ C: ii and iii only
○ D: None of them is true

15. Domain of csc θ is θ Є R except θ = ?

○ A: nπ where n Є Z
○ B: [(2n+1)/2] π where n Є Z
○ C: nπ/2 where n Є Z
○ D: (2n+1/2)π where n Є Z

16. If $\sec\theta + \tan\theta = x$ then $\tan\theta$ = ?

○ A: $(x^2 - 1) / x$
○ B: $(x^2 + 1) / x$
○ C: $(x^2 + 1) / 2x$
○ D: $(x^2 - 1) / 2x$

17. Which of the following is not possible?

○ A: $\sin\theta = 3/4$
○ B: $\tan\theta = 75$
○ C: $\operatorname{cosec}\theta = 5/3$
○ D: $\cos\theta = (1 + t^2) / (1 - t^2)$

18. The value of $\sin^2 \pi/8 + \sin^2 3\pi/8 + \sin^2 5\pi/8 + \sin^2 7\pi/8$ is?

○ A: -1
○ B: 0
○ C: 1
○ D: 2

19. If tan A = 1/2, then tan 2A is equal to?

○ A: 1
○ B: 1/2
○ C: 4/3
○ D: 5/4

20. If A = B = C = 60° then $\dfrac{tanA + tanB + tanC}{tanA * tanB * tanC}$ = ?

○ A: 0
○ B: 1
○ C: -1
○ D: √3

Inverse Trigonometric Function

TEST 1

1. **Which of the following is true?**

$\sin^{-1} x = (\sin x)^{-1,}$ $\cos^{-1} x = (\cos x)^{-1,}$ $\tan^{-1} x = (\cot x)^{-1}$

○ A: i and ii only ○ B: ii only

○ C: i, ii and iii ○ D: None of them is true.

2. **$\cos^{-1} A + \cos^{-1} B$ = ?**

○ A: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$

○ C: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$

○ D: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$

3. **Principal value of $\sin^{-1}(-\sqrt{3}/2)$ = ?**

○ A: $-2\pi/3$ ○ B: $-\pi/3$

○ C: $\pi/3$ ○ D: $2\pi/3$

4. **Range of $y = \sin^{-1} x$ is?**

○ A: $-\pi/2 \leq y \leq \pi/2$ ○ B: $-\pi \leq y \leq \pi$

○ C: $-\pi/4 \leq y \leq \pi/4$ ○ D: $-1 \leq y \leq 1$

The value of $\tan^{-1}(-1/\sqrt{3})$ is?

○ A: $\pi/3$ ○ B: $-\pi/4$

○ C: $3\pi/4$ ○ D: $-\pi/6$

5. **What is the value of $\tan^{-1} 3/4 + \tan^{-1} 5/12$?**

○ A: $\tan^{-1} 56/33$ ○ B: $\tan^{-1} 16/33$

○ C: $\tan^{-1} 15/48$ ○ D: $\tan^{-1} 16/63$

6. **$y = \tan x$ is called principal tangent function if ?**

○ A: - infinity < x < infinity ○ B: $-\pi < x < \pi$

○ C: $-\pi/2 < x < \pi/2$ ○ D: $0 < x < \pi$

7. **$\cos^{-1}(-1/2)$ = ?**

○ A: $\pi/3$ ○ B: $-2\pi/3$

○ C: $2\pi/3$ ○ D: Both B and C.

8. **Range of $y = \cos^{-1} x$ is?**

○ A: $-\pi/2 \leq y \leq \pi/2$ ○ B: $-\pi \leq y \leq \pi$

○ C: $0 \leq y \leq \pi/2$ ○ D: $0 \leq y \leq \pi$

9. **$2 \tan^{-1} A$ = ?**

○ A: $\tan^{-1} 2A / (1 + A^2)$ ○ B: $\tan^{-1} 2A / (1 - A^2)$

○ C: $\tan^{-1} A / (1 + A^2)$ ○ D: $\tan^{-1} A / (1 - A^2)$

10. **$\cos(\cos^{-1} 1/5)$ = ?**

○ A: 1 ○ B: 5

○ C: 1/5 ○ D: 4/5

11. $\cos(\sin^{-1} 1/\sqrt{2}) = ?$

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}/3$
○ C: $2/\sqrt{3}$
○ D: $1/2$

12. $\cos^{-1} A - \cos^{-1} B = ?$

○ A: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$
○ D: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

13. Which of the following function has domain ranging from - infinity to + infinity ?

○ A: $y = \sin^{-1} x$
○ B: $y = \sec^{-1} x$
○ C: $y = \cos^{-1} x$
○ D: $y = \tan^{-1} x$

TEST 2

1. The value of sec $\left[\tan^{-1}\left(\frac{b+a}{b-a}\right) - \tan^{-1}\left(\frac{a}{b}\right)\right]$ is

○ A: $\sqrt{3}/2$
○ B: $\sqrt{2}$
○ C: 1
○ D: $1/\sqrt{3}$

2. If $y = \sin^{-1} x$ then $\cos(\sin^{-1} x) = ?$

○ A: $(1-x)^{1/2}$
○ B: $(1-x)^{1/2}$
○ C: $(1-x^2)^{1/2}$
○ D: $(1+x^2)^{1/2}$

3. $\cos[\tan^{-1} 1/3 + \tan^{-1} 1/2] = ?$

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}$
○ C: $\sqrt{3}/2$
○ D: $1/2$

4. $\cot^{-1}(-1) = ?$

○ A: 1
○ B: $\pi/2$
○ C: $2\pi/3$
○ D: $3\pi/4$

5. Principal value of $\sin^{-1}(\sin 3\pi/5) = ?$

○ A: $3\pi/5$
○ B: $4\pi/5$
○ C: $2\pi/5$
○ D: $\pi/5$

6. What is the principal value of $\cot^{-1}(-1/\sqrt{3})$?

○ A: $3\pi/2$
○ B: $\pi/3$
○ C: $\pi/6$
○ D: $2\pi/3$

7. $\sin^{-1} 3/5 + \sin^{-1} 8/17 = ?$

○ A: $\sin^{-1}(11 / 23)$
○ B: $\sin^{-1}(19 / 76)$
○ C: $\sin^{-1}(63 / 95)$
○ D: $\sin^{-1}(77 / 85)$

8. Which of the following is Domain and Range of $y = \cot^{-1} x$?

○ A: Domain: $-\infty < x < \infty$ Range: $-\pi/2 < y < \pi/2$
○ B: Domain: $-1 < x < 1$ Range: $-\pi/2 < y < \pi/2$
○ C: Domain: $-\infty < x < \infty$ Range: $-\pi < y < \pi$
○ D: Domain: $-\infty < x < \infty$ Range: $0 < y < \pi$

9. Principal value of $\sin^{-1}[\sin(2\pi/3)] = ?$

○ A: $2\pi/3$
○ B: $-2\pi/3$
○ C: $\pi/3$
○ D: $\pi/6$

10. $\cos(\sin^{-1} 3/5) = ?$

○ A: 3/5
○ B: 1/3
○ C: 4/5
○ D: $2/\sqrt{3}$

11. Range of $y = \tan^{-1} x$ is ?

○ A: $-\pi/2 < y < \pi/2$
○ B: $-\pi/2 \le y \le \pi/2$
○ C: $0 \le y \le 2\pi$
○ D: $0 < y < 2\pi$

12. $tan^{-1}\dfrac{a-b}{1+ab} + tan^{-1}\dfrac{b-c}{1+bc} = ?$

○ A: $\tan^{-1} a - \tan^{-1} c$
○ B: $\tan^{-1} a - \tan^{-1} b$
○ C: $\tan^{-1} b - \tan^{-1} c$
○ D: $\tan^{-1} c - \tan^{-1} a$

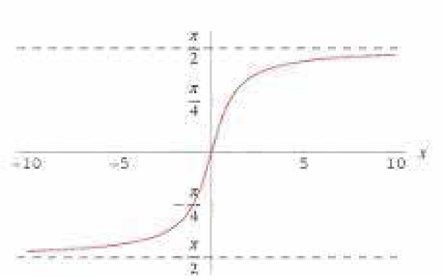
13. If $\alpha = 2\cos^{-1} 4/5$ then $\sin\alpha = ?$

○ A: 3/5
○ B: 24/25
○ C: 4/5
○ D: 30/25

14. $sin^{-1}(2x\sqrt{1-x^2}) = ?$

○ A: $\sin^{-1} x$
○ B: $2\sin^{-1} x$
○ C: $3\sin^{-1} x$
○ D: $4\sin^{-1} x$

15. The graph below is for which function?



○ A: $y = \sin^{-1} x$
○ B: $y = \cos^{-1} x$
○ C: $y = \tan^{-1} x$
○ D: $y = \cot^{-1} x$

16. If $\tan^{-1}(1 + x) + \tan^{1}(1 - x) = \pi/2$ then $x = ?$

○ A: 0
○ B: 1
○ C: -1
○ D: $\sqrt{3}$

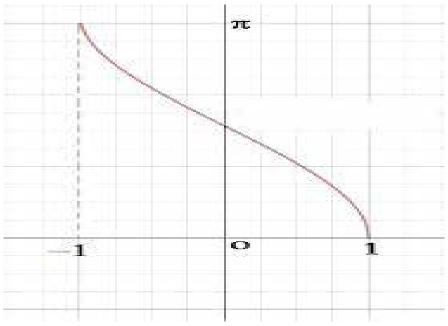
17. $y = \sec x$ is called a principal secant function if?

○ A: $-\pi \le x \le \pi$ and $x \ne \pi/2$ or $-\pi/2$
○ B: $-\pi/2 < x < \pi/2$
○ C: $0 \le x \le \pi$ and $x \ne \pi/2$
○ D: $0 \le x < \pi/2$

18. If $\alpha = \sin^{-1} 5/13$, then $\cos\alpha = ?$

○ A: 8/13
○ B: 7/13
○ C: 11/13
○ D: 12/13

19. The graph below is for which function?



○ A: $\sin^{-1} x$

○ B: $\cos^{-1} x$

○ C: $\tan^{-1} x$

○ D: $\cot^{-1} x$

20. $\mathrm{cosec}^{-1} (-2/\sqrt{3})$ = ?

○ A: $\pi/3$

○ B: $-\pi/3$

○ C: $4\pi/3$

○ D: $-4\pi/3$

TEST 3

1. $\sin (\sin^{-1} 1/5 + \cos^{-1} x) = 1$ then x = ?

○ A: 2/5

○ B: 1/3

○ C: 1/5

○ D: 1/2

2. $\sin (2\cos^{-1} x)$ = ?

○ A: $2x\sqrt{1-x^2}$

○ B: $2x\sqrt{1-x}$

○ C: $\frac{2x}{\sqrt{1-x^2}}$

○ D: $\frac{2x}{\sqrt{1+x^2}}$

3. Domain and range of $y = \csc^{-1} x$ is ?

○ A: Domain : $-\infty < x < \infty$ Range : $-\pi/2 \le y \le \pi/2$

○ B: Domain : $-1 \le x \le 1$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ C: Domain : $1 \le |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ D: Domain : $1 > |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

4. $\sin (\cos^{-1} -2/3)$ = ?

○ A: $1/\sqrt{2}$

○ B: $\sqrt{5}/3$

○ C: $1/\sqrt{3}$

○ D: $\sqrt{3}$

5. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, what is the value of x?

○ A: 1/6

○ B: -1

○ C: -1 and 1/6

○ D: 1

6. $\cos^{-1} (\cos 7\pi/6)$ = ?

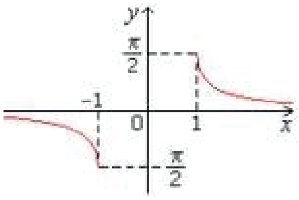
○ A: $7\pi/6$

○ B: $\pi/6$

○ C: $5\pi/6$

○ D: $\pi/3$

7. The graph below is for which function?



○ A: $y = \tan^{-1} x$
○ B: $y = \cot^{-1} x$
○ C: $y = \sec^{-1} x$
○ D: $y = \csc^{-1} x$

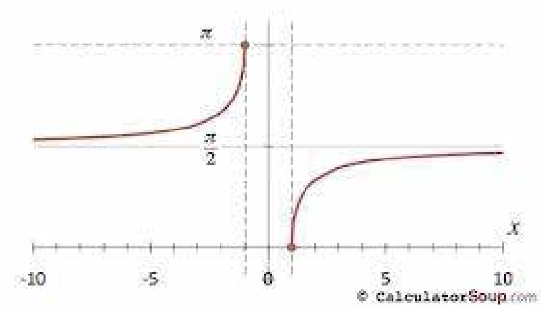
8. If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$, then $\cos^{-1} x + \cos^{-1} y$ is equal to ?

○ A: $2\pi/3$
○ B: $3\pi/2$
○ C: $\pi/5$
○ D: $\pi/3$

9. $\tan^{-1} (-x) = ?$

○ A: $\tan^{-1} (x)$
○ B: $- \tan^{-1} (x)$
○ C: $- \cot^{-1} (x)$
○ D: $\cot^{-1} (x)$

10. The graph below is for which function?



○ A: $y = \tan^{-1} x$
○ B: $y = \cot^{-1} x$
○ C: $y = \csc^{-1} x$
○ D: $y = \sec^{-1} x$

11. $\tan (\sin^{-1} x) = ?$

○ A: $x / (1-x^2)$
○ B: $x / (1-x)$
○ C: $\frac{x}{\sqrt{1+x^2}}$
○ D: $\frac{x}{\sqrt{1-x^2}}$

12. $\sin\left[\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right] =$

○ A: $\sqrt{3}/2$
○ B: $-\sqrt{3}/2$
○ C: ½
○ D: - 1/2

13. The value of $\tan (\cos^{-1}(4/5) + \tan^{-1} (2/3))$ is equal to ?

○ A: 7/5
○ B: 17/6
○ C: 17/18
○ D: Cannot be determined.

14. The value of $\tan^{-1}1 + \tan^{-1} 2 + \tan^{-1} 3$ is ?

○ A: $\pi/2$
○ B: -1
○ C: 1
○ D: 0

15. $\tan(\sin^{-1} -3/4) = ?$

○ A: $3/\sqrt{5}$ ○ B: $-3/\sqrt{5}$

○ C: $3/\sqrt{7}$ ○ D: $-3/\sqrt{7}$

16. Value of $\cos(\tan^{-1} 15/8 - \sin^{-1} 7/25) = ?$

○ A: 114/350 ○ B: 297/425

○ C: 215/345 ○ D: 138/147

17. The product of the roots of the equation $\tan^{-1}(2x) + \tan^{-1}(3x) = 3\pi/4$ is ?

○ A: -1/6 ○ B: -1/2

○ C: 1 ○ D: 3

Function And Limits

TEST 1

1. If $f(x,y,z)=2x+3y-z$ and $f(a,b,0)=f(0,a,b)$, then b / a equals

○ A: 0 ○ B: 2

○ C: ½ ○ D: 1/4

2. Range of the function $f(x) = \sqrt{36 - x^2}$ is

○ A: $[0, -\infty]$ ○ B: $[\infty, -\infty]$

○ C: $[0, 6]$ ○ D: $[36, 1]$

3. If $f(x) = 3x^2 - 2x + 4$, $f(-2) =$

○ A: -2 ○ B: 20

○ C: 4 ○ D: 12

4. If $g(x) = x^3 - x^2 - x - 1$, then the value of $g(-1)$ is:

○ A: 0 ○ B: 1

○ C: -2 ○ D: 2

5. Let $f(x) = 3x^2 + 4$, $g(x) = 2$ and $h=\{(1,2),(2,1),(3,2)\}$.

○ A: f(x) is the only function. ○ B: f(x) and g(x) are the only functions.

○ C: f(x), g(x) and h(x) are all functions.

○ D: None of these are functions.

6. If $f(x)=3$ and $g(x)=2$, then $f(g(x))=$

○ A: 2 ○ B: 3

○ C: 6 ○ D: 5

7. Range of the function $f(x) = 2x - 3$ is

○ A: $(-\infty, +\infty)$ ○ B: [2,3]

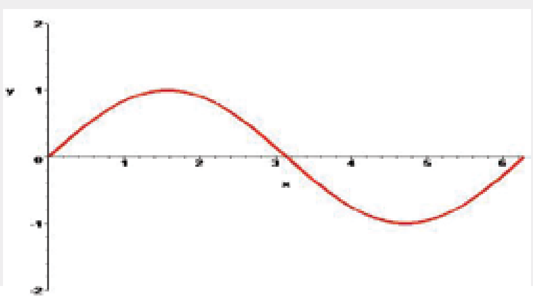
○ C: [2,10] ○ D: None of the above.

8. If f(x)=2x+3 and g(x) = x^2 - 1, then f(g(2))=

○ A: 4 ○ B: 9

○ C: 13 ○ D: 19

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If p(x)=4x-6 and p(a)=0, then a=

○ A: 3 ○ B: 2

○ C: 3/2 ○ D: 2/3

11. If f(x)=x and g(x)=x.f(x), then f(x) / g(x) =

○ A: x ○ B: 1/x

○ C: 1 ○ D: None of the above.

12. If $f(x) = x^7 - 97x^6 - 199x^5 + 99x^4 + 2x + 195$, $f(-1)$ equals:

○ A: 24 ○ B: 154

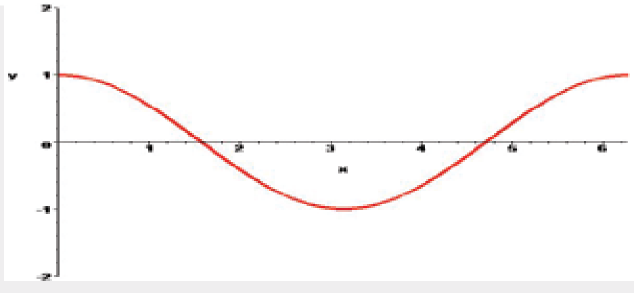
○ C: 272 ○ D: 393

13. What value(s) must be excluded for the domain of f={(x,y):y=$\frac{x+2}{x-2}$}?

○ A: 2 ○ B: -2

○ C: 0 ○ D: 2 and -2

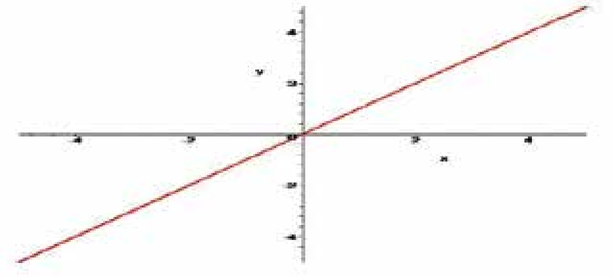
14. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the Above

16. If f(1) = 1 and f(2) = 2 and f(-1) = -1, then f(x) would be:

○ A: 0 ○ B: 1

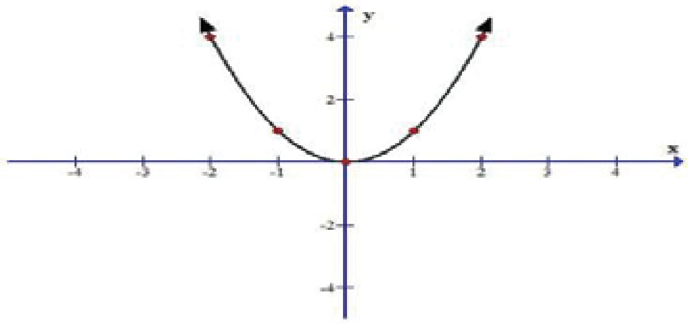
○ C: 2 ○ D: x

17. If $f(r,\theta) = r\cos\theta$, $f(2,\frac{\pi}{3}) =$

○ A: 2π ○ B: 1

○ C: $\frac{\pi}{6}$ ○ D: $\frac{1}{2}$

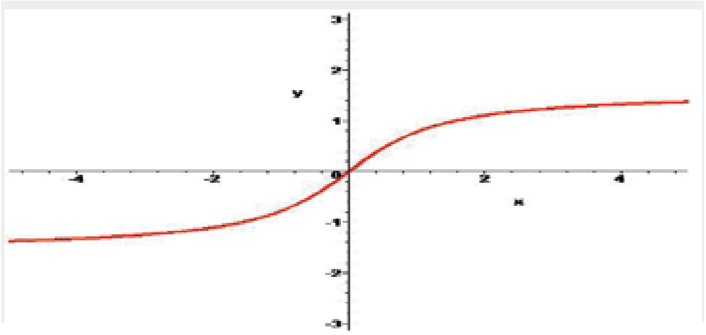
18. Which of the following functions represents the plot shown?



○ A: $f(x) = x^2$ ○ B: $f(x) = x^2 - x - 5$

○ C: $f(x) = x^3$ ○ D: None of the above.

19. The following figure shows a graph of which type of function?



○ A: Cosecant ○ B: Secant

○ C: Cotangent ○ D: Arctangent

20. If $f(x, y, z) = x^2 + y^2 - 2z$ for all real numbers x, y and z, then f(-1,-1,-1)=

○ A: 0 ○ B: 2

○ C: 4 ○ D: 6

TEST 2

1. If f(x,y)=3x+2y-8 and g(z) = z^2 for all real numbers x,y,z then f(3,g(4))=

○ A: 15
○ B: 33
○ C: 45
○ D: 25

2. For a function to be even as well as odd, it must be:

○ A: Symmetric about origin (by 180^0)
○ B: Symmetric about y-axis (by 180^0)
○ C: Both A and B
○ D: None of the above

3. If g(x)=3 and $f(x) = \dfrac{1}{3x+2}$, then f(g(3))=

○ A: 1/11
○ B: 1/17
○ C: 3/5
○ D: 9/11

4. Which statement is correct for the following functions?

$$f(x) = \frac{2}{7}x^2, \qquad g(x) = -x^3$$

○ A: Both I and II are even.
○ B: Both I and II are odd.
○ C: I is even and II is odd.
○ D: I is odd and II is even.

5. If f(x) = x+3 and g(x) = x^2 , for what value of does f(g(x))=g(f(x))

○ A: 1
○ B: 0
○ C: -1
○ D: 2

6. Which of the following relations are said to be odd?

$y=x^2 + 1$, $y=\sin(x)$, $y = x^3 - x + 1$

○ A: Only II.
○ B: Only I & II.
○ C: Only I & III.
○ D: Only II & III.

7. Find the inverse of $g(x) = \dfrac{2x}{x-1}$

○ A: $g^{-1}(y) = \dfrac{y+5}{y-2}$
○ B: $g^{-1}(y) = \dfrac{y}{y-2}$
○ C: $g^{-1}(y) = \dfrac{y-7}{y}$
○ D: $g^{-1}(y) = \dfrac{y+4}{y-2}$

8. If f(x) = $x^2 + 3x - 4$ and g(x)=x-4, then f(g(x))=

○ A: $2x^2 - 3x + 2$
○ B: $2x^2 - 3x$
○ C: $x^2 - 5x + 10$
○ D: $x^2 - 5x$

9. Find $\lim\limits_{x\to 1} \dfrac{\sqrt{x}-1}{x-1}$

○ A: ¼
○ B: 1/2
○ C: 1
○ D: 2

10. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is correct:

○ A: If $f(x) \geq 0$, then $\lim_{x\to a} f(x) \geq 0$

○ B: If $f(x) \geq g(x)$, then $\lim_{x\to a} f(x) \geq \lim_{x\to a} g(x)$

○ C: If $f(x) \geq 0$, then $\lim_{x\to a} \sqrt{f(x)} = \sqrt{\lim_{x\to a} f(x)}$

○ D: All are correct.

11. If {(3,2),(4,2),(3,1),(7,1),(2,3)} is to be a function, which of the following must be removed from the set?

○ A: (3,2) ○ B: (4,2)

○ C: (2,3) ○ D: None of the above.

12. To show a function is discontinuous, we can do one of three things:

Show that the function fails the sequence definition, Show that the function fails the ε -> δ definition

Prove by contradiction by relating it to a function known to be discontinuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

○ C: None of these are correct. ○ D: (i), (ii) and (iii) are correct.

13. If f(x,y)=x+y and g(x,y)=x-y, then f(g(2,1),f(2,-1)) equals:

○ A: 0 ○ B: 1

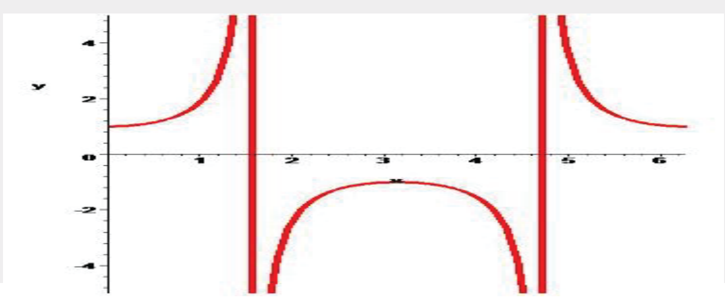
○ C: 2 ○ D: 4

14. Range of the function f(x)= sin (x) is

○ A: [-1,1] ○ B: $[-\frac{\pi}{2}, \frac{\pi}{2}]$

○ C: [0,1] ○ D: None of the above.

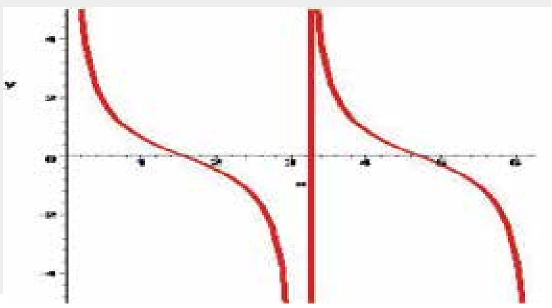
15. The following figure shows a graph of which type of function?



○ A: Tangent ○ B: Secant

○ C: Cosecant ○ D: Cosine

16. The following figure shows a graph of which type of function?



○ A: Cotangent ○ B: Arctangent

○ C: Cosecant ○ D: Tangent

17. f(x)=cos x, g(x)=sin x, h(x) = ±√x

○ A: f(x) is the only function. ○ B: g(x) is the only function.

○ C: f(x) and g(x) are the only function.

○ D: All three are functions.

18. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is not true:

○ A: $\lim_{x\to a}(f(x) \pm g(x)) = \lim_{x\to a} f(x) \pm \lim_{x\to a} g(x)$

○ B: $\lim_{x\to a}(f(x)g(x)) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$

○ C: $\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$

○ D: $\lim_{x\to a} |f(x)| = -\left|\lim_{x\to a} f(x)\right|$

19. If $f(x,y) = 2x^2 - y^2$ and $g(x) = 2^x$, which of the following equal 2^{2x} ?

○ A: f(x,g(x)) ○ B: f(g(x),x)

○ C: f(g(x),g(x)) ○ D: f(g(x),0)

20. If $f(x) = 4x + 2$ for all x, then for x=0.5 $f^{-1}(x) =$?

○ A: 4 ○ B: $\frac{1}{16}$

○ C: $\frac{1}{4}$ ○ D: $-\frac{3}{8}$

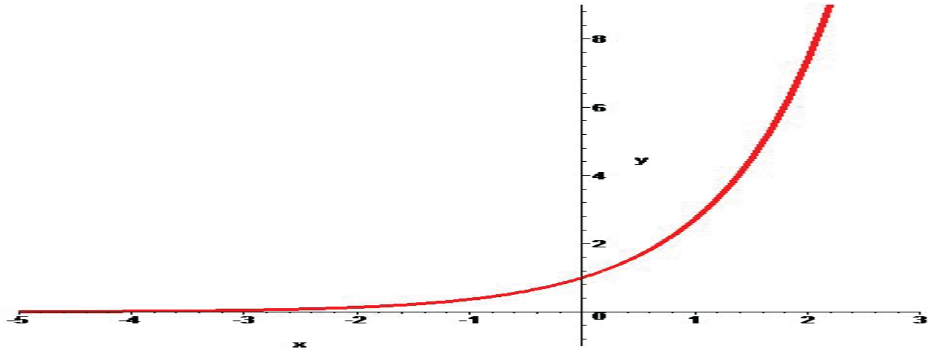
TEST 3

1. If g(x-1)= $x^2 + 2$, then g(x)=

○ A: $x^2 - 2x + 3$ ○ B: $x^2 + 2x + 3$

○ C: $x^2 - 2x + 6$ ○ D: $x^2 - 2x$

2. The following figure shows graph of which type of function?



○ A: Log Function ○ B: Exponential Growth

○ C: Exponential Decay ○ D: None of the above.

3. If $f(x) = 3x - 5$ and $g(y) = y^2 - 1$, then f(g(z)) equals

○ A: $(3z - 5)^2 - 1$ ○ B: $3z^2 - 8$

○ C: $3z^3 - 5z^2 - 3z + 8$ ○ D: $x^2 + 3z - 8$

4. $\lim\limits_{x \to 0} \dfrac{\cos(2x) - 1}{\cos x - 1}$ **= ?**

○ A: 2 ○ B: 4

○ C: 8 ○ D: 10

5. $\lim\limits_{h \to 0} \dfrac{\cos h - 1}{h} =$

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

6. $\lim\limits_{x \to 0} \dfrac{x^4 + 5x - 3}{2 - \sqrt{x^2 + 4}}$ **= ?**

○ A: 6 ○ B: 15

○ C: ∞ ○ D: None of the above.

7. If f(x) = x^2 - 4, for what real number values of x will f(f(x))=0?

○ A: $\sqrt{6}$ ○ B: $\pm\sqrt{6}$

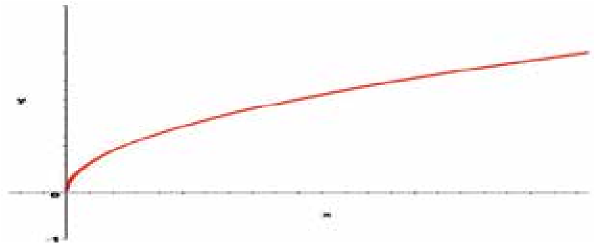
○ C: $\pm\sqrt{2} or \pm \sqrt{6}$ ○ D: No values

A straight line function, whose graph bisects the second and the fourth quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: a ○ B: -a

○ C: -2a ○ D: 0

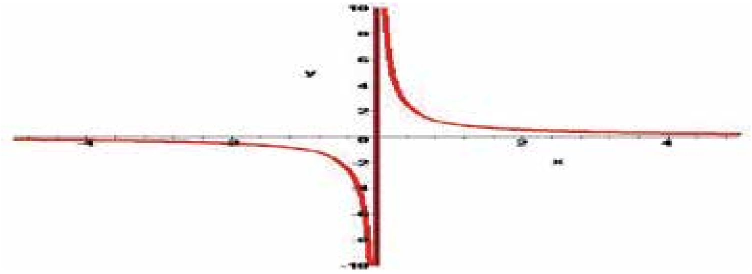
8. The following figure may show a graph of which function?



○ A: $y = \sqrt{x}$ ○ B: $y = \sqrt[6]{x}$

○ C: $y = \sqrt[5]{x}$ ○ D: Both A and B.

9. The figure shown below depicts a graph of which of the following functions?



○ A: y=x+5

○ B: $y = x^2 / (x+2)$

○ C: $y = x^3 - 4$

○ D: $y = 1 / x^3$

10. If $f(x) = 2^x$, then $f(\log_2 5)$=

○ A: 2^5

○ B: 2^2

○ C: 2

○ D: 5

11. If f is a linear function and f(1)=-2,f(-2)=1 and f(x)=1.5, what is x?

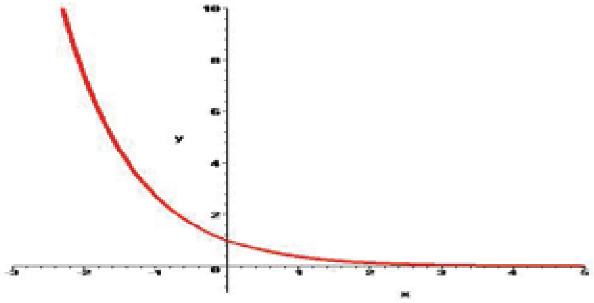
○ A: 0.5

○ B: -0.5

○ C: -1.5

○ D: -2.5

The wing figure shows a graph of which type of function?



○ A: Log function

○ B: Exponential Growth

○ C: Exponential Decay

○ D: None of the above.

12. If $f(x) = 3 - 2x + x^2$, then $\dfrac{f(x+t) - f(x)}{t}$ equals

○ A: t-x+4

○ B: t+2

○ C: t+2x-2

○ D: 2x-2

13. To show a function is continuous, we can do one of three things:

Show it satisfies the sequence definition of continuity, Show it satisfies the ε -> δ definition of continuity

Decompose it into simpler functions we already know to be continuous

○ A: Only (i) is correct.

○ B: Only (i) and (iii) are correct.

○ C: (i), (ii) and (iii) are correct.

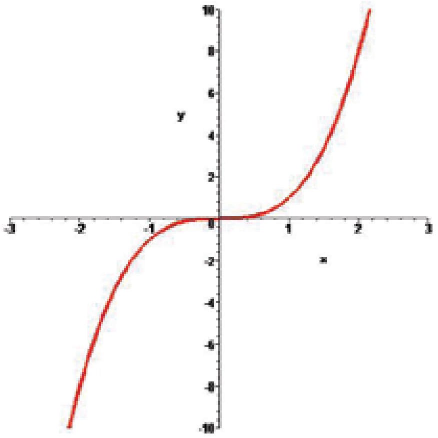
○ D: None of these are correct.

14. **If** $f(x) = \left\{\begin{array}{lll} \frac{5}{x-2} & when & x \neq 2 \\ k & when & x = 2 \end{array}\right\}$**, what must the value 'k' equal in order that f(x) be a continuous** function?

○ A: 2 ○ B: 5

○ C: 0 ○ D: No value of k will make f(x) a continuous function.

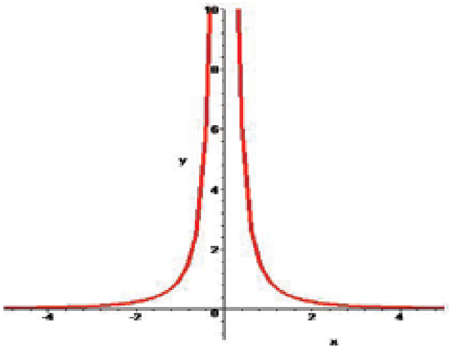
15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the above.

16. The figure shown below depicts a graph of which of the following functions?



○ A: $y = x^2 + 2x + 3$ ○ B: $y = 1 / x^2$

○ C: $y = 1 / x^3$ ○ D: None of the above.

17. If $f(x) = \dfrac{3x-1}{2}$ **and f(g(x))=x, then g(x)=**

○ A: $\dfrac{2x-1}{3}$ ○ B: $\dfrac{2x+1}{3}$

○ C: $\dfrac{2x}{3}+1$ ○ D: $\dfrac{2x}{3}-2$

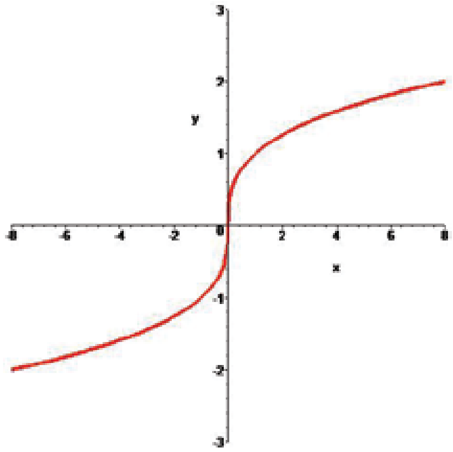
18. A straight line function, whose graph bisects the first and the third quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: 0 ○ B: 1

○ C: a ○ D: 2a

TEST 4

1. **The figure shown may depict a graph of which of the following functions?**



○ A: $y = \sqrt[3]{x}$
○ B: $y = \sqrt[4]{x}$
○ C: Both A and B.
○ D: None of the above.

2. **Find** $\lim\limits_{x\to\infty} \dfrac{x^2+5x+1}{2x^2-10}$

○ A: 1/6
○ B: 1/4
○ C: ½
○ D: 1

3. **Domain of the function f(x) = 5x^3 + 4x^2 +2x - 5 is:**

○ A: (-∞ , +∞)
○ B: (-4,4)
○ C: (-5,5)
○ D: None of the above.

4. **f={(x,y):y=4}, g={(x,y):$x^2 - y^2$=1}, and h={(x,y):x=3}, which of the these is a function?**

○ A: f only
○ B: g only
○ C: h only
○ D: f and h only

5. **If f(x) = x^2 + 1 and f(g(x))=4x-3, then g(x)=**

○ A: $2\sqrt{x}-1$
○ B: $2\sqrt{x-1}$
○ C: $\sqrt{x-1}$
○ D: x-4

6. **If g(x)=3x+2 and g(f(x))=x, then f(2)=**

○ A: 2
○ B: 6
○ C: 0
○ D: 8

7. **If f(x,y)=2x-y and g(z)=sin z, then** $g(f(\pi, \frac{\pi}{2}))$ **equals:**

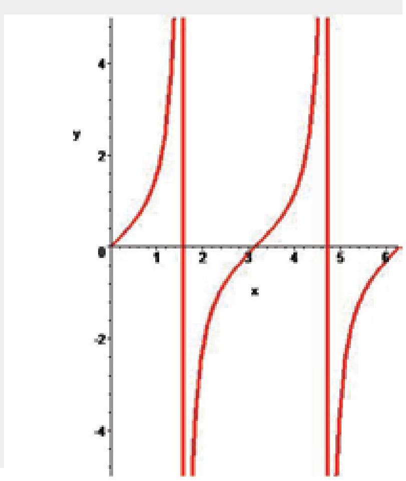
○ A: 0
○ B: -1
○ C: 1
○ D: 2

8. Which of the following is the inverse of the function $f(x) = \sqrt{x} - 1$, for all x>0?

○ A: $(x+1)^2$ ○ B: $x^2 + 2$

○ C: x+1 ○ D: x-2

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If $f(x) = x - \frac{1}{x}$, then $f(a) - f(\frac{1}{a})$ equals:

○ A: 0 ○ B: 2a - 2/a

○ C: a - 1/a ○ D: 1

11. If f(x)=2x-3, the inverse of f(x) could be represented by:

○ A: $f^{-1}(x) = 3x - 2$ ○ B: $f^{-1}(x) = \frac{1}{2x-3}$

○ C: $f^{-1}(x) = \frac{x+2}{3}$ ○ D: $f^{-1}(x) = \frac{x+3}{2}$

12. What value(s) must be excluded for the domain of $\frac{f}{g}(x)$ if $f(x) = 3x^2 - 4x + 1$ and $g(x) = 3x^2 - 3$?

○ A: 0 ○ B: 3

○ C: 1 ○ D: both ±1

13. $\lim_{x=3} = \frac{5x^2 - 8x - 13}{x^2 - 5}$ = ?

○ A: 0 ○ B: 5

○ C: -2 ○ D: 2

14. If f(g(x)) = x^2 - 10 and g(x)=x+3 , then f(x)=

○ A: $x^2 + 6x + 8$ ○ B: $x^2 - 6x - 1$

○ C: $x^2 - 6x$ ○ D: $x^2 + 8$

15. If f(x)=x, the inverse of f, f^{-1}, could be represented by:

○ A: $f^{-1}(x) = x$ ○ B: $f^{-1}(x) = 1$

○ C: $f^{-1}(x) = y$ ○ D: $f^{-1}(x) = \frac{1}{x}$

16. If f(x) = x^3 - 4, then the inverse of f=

○ A: $-x^3 + 4$ ○ B: $\sqrt[3]{x+4}$

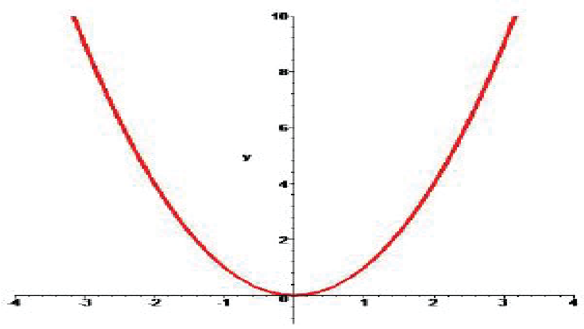
○ C: $\sqrt{x-4}$ ○ D: $\frac{1}{x-4}$

17. Find $\lim_{x\to 4} \frac{x^2 - 6x + 8}{x - 4}$.

○ A: -2 ○ B: 0

○ C: 2 ○ D: 4

18. The following figure shows graph of which type of function?



○ A: Linear function ○ B: Even degree polynomial

○ C: Inverse of even degree polynomial ○ D: Inverse of odd degree polynomial

19. Find $\lim_{x\to\infty} \frac{3x^2 + 1}{4x^3 + 2x + 1}$

○ A: 0 ○ B: 4

○ C: 10 ○ D: 15

20. If f(x) = ax^2 + bx + c and f(1) = 3 and f(-1) = 3, then a+c equals

○ A: -3 ○ B: 0

○ C: 3 ○ D: 6

Differentiation

TEST 1

1. $\lim_{x\to 0} \frac{1-\cos x}{x} = ?$

○ A: 1 ○ B: 0

○ C: -1 ○ D: Infinity

2. d/dx f(x).g(x) = ?

○ A: f(x).g(x) ○ B: f'(x).g(x) + f(x).g'(x)

○ C: f'(x).g(x) - f(x).g'(x) ○ D: f'(x).g'(x) + f(x).g(x)

3. d/dx Sin^{-1} x = ?

○ A: $1/(1-x^2)^{1/2}$ ○ B: $-1/(1-x^2)^{1/2}$

○ C: $1/(1+x^2)^{1/2}$ ○ D: $-1/(1+x^2)^{1/2}$

4. What is the derivative of $(2x + 3)^5$?

○ A: $10(2x + 3)^4$ ○ B: $10(2x + 3)^6$

○ C: $5(2x + 3)^4$ ○ D: $5(2x + 3)^6$

5. dy/dx of f(x) = log(log (x)) is ?

(Please assume log as "Log to the base e" or Ln)

○ A: 1 / log x ○ B: x / log x

○ C: 1 / (x log x) ○ D: 2 / log x

6. $\frac{d}{dx} log(sin\, x) = ?$

○ A: tan x ○ B: cot x

○ C: 1 / sin x ○ D: 1 / cos x

7. If $y=e^x$, then the rate of change of y with respect to x at point (0,1) is?

○ A: e ○ B: 1

○ C: -1 ○ D: 2

8. Under which of the following condition the given expression is true?

$$\frac{f(x_1) - f(x)}{x_1 - x} = f'(x)$$

○ A: As x approaches the value of x_1. ○ B: As x_1 approaches the value of x.

○ C: As x approaches the value of 0. ○ D: Both A and B.

9. $\lim_{\Delta x\to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} = ?$

○ A: f'(x) ○ B: ∫ f(x)dx

○ C: ∫ f'(x)dx ○ D: None of the above.

10. If y = 1/ x^2 then dy/dx at x = -2 is ?

○ A: ¼
○ B: 1
○ C: ½
○ D: -1/2

11. d/dx sin x at x = π/2 is?

○ A: 1
○ B: -1
○ C: √2/2
○ D: 0

12. d/dx ($\cos^2 x + \sin^2 x$) = ?

○ A: 2 sin x + 2 cos x
○ B: 0
○ C: 2 sin x cos x
○ D: 1

13. Which of the following statement is false?

○ A: d/dx c = 0 ; where c is a constant.
○ B: d/dx [c f(x)] = c d/dx f(x)
○ C: d/dx [f(x) * g(x)] = d/dx f(x) * d/dx g(x)
○ D: d/dx [f(x) + g(x)] = d/dx f(x) + d/dx g(x)

14. Who is/or thought to be the inventor of differential calculus and fundamental theorums of calculus?

○ A: Albert Einstien.
○ B: Isaac Newton.
○ C: Gottfried Leibniz
○ D: Both B and C.

15. Derivative of ln e^{4x} w.r.t x is?

○ A: 4
○ B: 4x
○ C: $1/e^{4x}$
○ D: e^{4x}

16. The slope of a curve at point P = 7. If dx = 0.01 and it is very close to P then dy =?

○ A: 0
○ B: 0.7
○ C: 0.07
○ D: 0.49

17. The equation of a line is y = 9/4 x - 33. What is the property of dy/dx?

○ A: It is increasing.
○ B: It is decreasing.
○ C: It is a constant value.
○ D: It is first increasing and then decreasing.

18. $\frac{d}{dx}x^n \;=?$

○ A: nx
○ B: nx^n
○ C: nx^{n-1}
○ D: $1/n+1\ x^{n+1}$

19. What is the derivative of 1/ $(ax + b)^n$?

○ A: $-n (ax + b)^{-n-1}$
○ B: $- an (ax + b)^{n-1}$
○ C: $-an (ax + b)^{-n-1}$
○ D: $-n (ax + b)^{n-1}$

20. $\lim\limits_{\Delta x\to 0}\frac{f(x+\Delta x)-f(x)}{\Delta x} =?$

○ A: f' (x)
○ B: dy / dx
○ C: ∫ f''(x)dx
○ D: All of the above.

TEST 2

1. If the tangent to the graph of f(x) at the point "a" makes an angle of 45° with the x-axis, then what is the value of f'(x)?

○ A: 0
○ B: 1
○ C: 2
○ D: Not enough information.

2. The function f(x) = cot (x) sin (x) has how many stationary points in the interval [0 , 2π]?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

3. Which of the following is the correct expansion of sin x as Maclaurin series?

○ A: $1 - x + x^2 - x^3$ ....
○ B: $x - x^3/3! + x^5/5! - x^7/7!$ .....
○ C: $1 + x/1! - 2x/2! + 3x/3!$ .....
○ D: $1 + 0.1x + 0.01x + 0.001x$ ....

4. Which of the following is not true?

○ A: $a = d^2s/dt^2$
○ B: $a = dv/dt$
○ C: $v = \int a\, dt$
○ D: $v = \int s\, dt$

5. $\frac{d}{dx}(\frac{a+x}{a-x}) \; =?$

○ A: 0
○ B: $2(a+x) / (a-x)^2$
○ C: $2a / (a-x)^2$
○ D: $a / (a-x)^2$

6. What are the two positive integers, whose sum is hundred and product is maximum?

○ A: 30, 70
○ B: 45, 55
○ C: 43, 57
○ D: 50, 50

7. Value of e is equal to which of the following infinite series?

○ A: $1 + 1/1! + 1/2! + 1/3!$ ...
○ B: $1 + 0.1 + 0.01 + 0.001$ ...
○ C: $1 - 1^3/3! + 1^5/5! - 1^7/7!$ ....
○ D: $1! - 2! + 3! - 4!$ ...

8. What is the derivative of $(1 + \tan^2\theta)$ w.r.t tan θ?

○ A: 2 sec θ
○ B: 2 tan θ
○ C: $\sec^2 \theta$
○ D: $2 \tan\theta \sec^2\theta$

9. Which of the following is not true for function $f(x) = |4 - x^2|$?

○ A: Function value is always positive.
○ B: Function is continuous.
○ C: Function is differentiable at x = +2 and -2.
○ D: Its domain is the set of all real numbers.

10. $\frac{d}{dx}e^{e^x} \; =?$

○ A: $e^x e^{e^x}$
○ B: e^{e^x}
○ C: e^{2x}
○ D: $1/e^x$

11. $\frac{d}{dx}tan^{-1}\sqrt{\frac{1-cos\,x}{1+cos\,x}}\;=?$

○ A: 1
○ B: 2
○ C: ½
○ D: -1/2

12. Maximum value of (ln x) / x is ?

○ A: 0
○ B: 1
○ C: e
○ D: 1/e

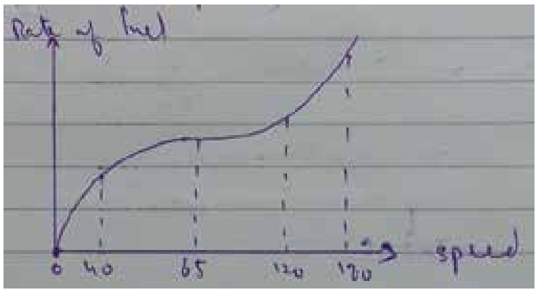
The maximum area of a rectangle of perimeter 176 cm is?

○ A: 1854 cm^2
○ B: 1936 cm^2
○ C: 2110 cm^2
○ D: 3246 cm^2

13. What is the derivative of $(x^3+1)^9$?

○ A: $9(x^3+1)^8$
○ B: $10(x^3+1)^{10}$
○ C: $9x^2\,(x^3+1)^8$
○ D: $27x^2\,(x^3+1)^8$

14. The graph below shows the rate of fuel consumption with respect to the speed of the car. What is the most efficient speed with repect to the fuel consumption?



○ A: 40
○ B: 65
○ C: 120
○ D: 180

15. Critical point on the graph is the point for which?

○ A: f'(x) = 0
○ B: f'(x) does not exist
○ C: f'(x) = 1
○ D: Both A and B.

16. Derivative of an even function is always ?

○ A: An odd function
○ B: An even function
○ C: Negative function
○ D: Could be even or odd

17. If distance s of an object is given by the function $s=100t - 25t^2$, then what is the velocity at t= 1/2?

○ A: 25
○ B: 50
○ C: 75
○ D: 100

18. $x^2 + y^2 = 4$ is the equation of a circle. What is the slope at a point where x = 0?

○ A: 0
○ B: 2
○ C: 4
○ D: 1/2

19. If y = f(f(x)) ; f(0) = 0 and f'(0) = 1, then y'(0) is equal to ?

○ A: 0
○ B: 1
○ C: 2
○ D: 1/2

TEST 3

1. If $y = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \_\_\_ \infty\right)$, then $\frac{dy}{dx} =$

○ A: 0
○ B: 1
○ C: x
○ D: y

2. **The function $x^3 + x^2 - 5x - 5$ is increasing at which interval?**

○ A: (-infinity , - 5/3]
○ B: [1 , infinity)
○ C: [-5/3 , 1]
○ D: Both A and B.

3. **d/dx cos(cos(cos x))) = ?**

○ A: -sin [cos (cos x)].sin x cos x
○ B: - cos [sin (sin x)] sin x sin x
○ C: -sin [cos (cos x)] sin (cos x) sin x
○ D: sin [cos (cos x)] cos (cos x)

4. $\frac{d}{dx}[\cos^{-1}(4x^3 - 3x)] = ?$

○ A: $\frac{3}{\sqrt{1-x^2}}$
○ B: $\frac{-3}{\sqrt{1-x^2}}$
○ C: $\frac{3}{\sqrt{1+x^2}}$
○ D: $\frac{-3}{\sqrt{1+x^2}}$

5. **y = |cos x| is not differentiable for x = ? (n in the given choices represent a set of integers)**

○ A: nπ/2
○ B: (2n+1) π/2
○ C: nπ
○ D: (n+1) π

6. **If $y = e^{2x + 3 \log x}$, then dy/dx is equal to?**

○ A: $x^2 e^{2x} (2x + 3)$
○ B: $x^2 e^{2x} (2x - 3)$
○ C: $x^3 e^{2x}$
○ D: $x^2 e^{2x} 2x$

7. **If x > 0 and xy = 1, then the minimum value of (x + y) is?**

○ A: -2
○ B: -1
○ C: 1
○ D: 2

8. **The point at which the curve $y = x^3 - 4x + 3$ has gradient 8 is?**

○ A: (2,3)
○ B: (4,5)
○ C: (1,0)
○ D: (0,1)

9. **If x = (cos θ + θ sinθ), y = (sinθ - θ cos θ), then dy/dx is equal to ?**

○ A: tan θ
○ B: cot θ
○ C: sin θ
○ D: cos θ

10. $\frac{d}{dx}\left(tan^{-1}\sqrt{\frac{1+cos\,x}{1-cos\,x}}\right) =?$

○ A: -1
○ B: 1
○ C: ½
○ D: -1/2

11. The graph f(x)=cot x has critical points at which of the following points in the interval [0,π]?

○ A: 0 and π ○ B: 0 and π/2

○ C: π and π/2 ○ D: π/4 and π/2

12. The minimum value of (x^2 + 250/x) = ?

○ A: 75 ○ B: 50

○ C: 5 ○ D: The function has no minimum value.

13. tan x is ____ function in the interval [0,π/2]?

○ A: Increasing ○ B: Decreasing

○ C: Constant ○ D: Discontinuous

14. The function x^3 - 27x + 5 is increasing when?

○ A: |x| > 3 ○ B: |x| < 3

○ C: x < -3 ○ D: x > 3

15. If $y = \tan^{-1}(\sqrt{1+x^2} + x)$, then $\frac{dy}{dx} = ?$

○ A: 1 / 2(1+x^2) ○ B: -1 / 2(1+x^2)

○ C: 1 / 2(1-x^2) ○ D: 2 / (1-x^2)

16. The point on the curve y = √x at which the tangent makes an angle of 45° with x axis is?

○ A: (1,1) ○ B: (1/16,1/4)

○ C: (4,2) ○ D: (1/4, 1/2)

17. If y = $12x^9 + 13x^7 + 5x^5$ +19 then which of the following is true?

○ A: $d^5y/dx^5 = 0$ ○ B: $d^7y/dx^7 = 0$

○ C: $d^9y/dx^9 = 0$ ○ D: $d^{10}y/dx^{10} = 0$

18. If x > 0, y > 0 and x + y = 18, then the maximum value of xy is?

○ A: 77 ○ B: 81

○ C: 85 ○ D: 144

19. If √x + √y = √a then dy/dx = ?

○ A: $(y/x)^{1/2}$ ○ B: $(x/y)^{1/2}$

○ C: $-(y/x)^{1/2}$ ○ D: $-(x/y)^{1/2}$

20. Derivative of $a^{\sqrt{x}}$ = ?

○ A: $a^{\sqrt{x}}$ ln a ○ B: $a^{\sqrt{x}}$

○ C: $a^{\sqrt{x}}$ / ln a ○ D: $a^{\sqrt{x}}$ ln a / 2√x

TEST 4

1. **What is $d^{19}y/dx^{19}$ if $y = e^{-x}$?**

   ○ A: e^{-x} ○ B: $-e^{-x}$

   ○ C: $19e^{-x}$ ○ D: $-19e^{-x}$

2. **The position of an object is given by $x = 15t - 5t^3$ where x is the position. What is the acceleration of the object when it is momentarily at rest?**

   ○ A: 0 ○ B: 1

   ○ C: 15 ○ D: -30

3. **A rectangle has perimeter 100m. Its maximum area would be?**

   ○ A: 480 m^2 ○ B: 625 m^2

   ○ C: 690 m^2 ○ D: 765 m^2

4. **The maximum value of function $f(x) = \sin x \cos x$ is?**

   ○ A: 1 ○ B: 2

   ○ C: ½ ○ D: 0

5. **If $x = \log t$ and $y = t^2 - 1$, then the value of d^2y/dx^2 at $t = 1$ is?**

   ○ A: 1 ○ B: 2

   ○ C: 3 ○ D: 4

6. **What is the second derivative of $(3t + 2)^{-2}$ with respect to t?**

   ○ A: $-6(3t + 2)^{-3}$ ○ B: $6(3t + 2)^{-4}$

   ○ C: $54(3t + 2)^{-3}$ ○ D: $54(3t + 2)^{-4}$

7. **What is the derivative of sin x w.r.t cos x?**

   ○ A: cos x ○ B: tan x

   ○ C: - cot x ○ D: - cos x sin x

8. **d/dx sin x^o = ? (x is in degrees)**

   ○ A: cos x^o ○ B: x cos x^o

   ○ C: (- π/180) cos x^o ○ D: (π/180) cos x^o

9. $\frac{d}{dx}e^{ln\,sin\,x^2} =?$

   ○ A: $2x \cos x^2$ ○ B: $x \cos x^2$

   ○ C: $\cos x^2$ ○ D: $1/\sin x * 2\ e^{\sin x}$

10. **If $d/dx\,(3x^3 + x) = d/dx\,(-3x^2 - 5)$ then x = ?**

    ○ A: 1 or 2 ○ B: -1/3

    ○ C: 0 or -1/3 ○ D: 0 or 1

11. **$d(x^x) / dx$ = ?**

    ○ A: x^x (1 + log x) ○ B: 1 + log x

    ○ C: log x ○ D: x log x

12. If $y = 3x^2 - 12x + 8$ then the slope of tangent at point (3,-1) is?

○ A: -18 ○ B: 6
○ C: -19 ○ D: 8

13. The curve y = sin (x) with domain = set of all real numbers has how many stationary points?

○ A: Infinite ○ B: 0
○ C: 1 ○ D: 2

14. The derivative of e^x sinx w.r.t. e^x is

○ A: cos x + sin x ○ B: cos x
○ C: sin x ○ D: e^x(sin x + cos x)

15. If $\sin x = \dfrac{t}{\sqrt{1+t^2}}$, then $\dfrac{dx}{dt}$ is equal to

○ A: 1 ○ B: $1 / (1+t^2)$
○ C: $1 / (1 - t)^{1/2}$ ○ D: $1 / (1 + t^2)^{1/2}$

16. Differentiating $\ln(x^2 + 2x)$ w.r.t x gives?

○ A: $1 / (x^2+2x)$ ○ B: ln (2x + 2)
○ C: (2x+2) / x ○ D: $(2x+2) / (x^2+2x)$

17. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \ldots \text{to } \infty}}}$, then $\dfrac{dy}{dx}$ is equal to

○ A: x / (2y - 1) ○ B: x / (2y + 1)
○ C: log x / (2y - 1) ○ D: 1 / x(2y - 1)

18. If $y = \tan^{-1}\left(\dfrac{\sqrt{1+x^2}-1}{x}\right)$ and $\theta = \tan^{-1}x$, then $\dfrac{dy}{d\theta} = ?$

○ A: 1 ○ B: 1/2
○ C: -1/2 ○ D: x/2

19. What is the derivative of $(x^2 + 1)(x^3 + 7)$ w.r.t x is?

○ A: $5x^3 + 15x + 14$ ○ B: $5x^4 + 3x^2 + 14x$
○ C: $6x^3$ ○ D: $6x^3 + 7$

20. The graph of function y = x^3 has a _____ point at x = 0 ?

○ A: Inflection ○ B: Stationary
○ C: Turning ○ D: Both A & B.

Integration

TEST 1

1. **$\int f(x)g'(x)\,dx$ = ?**

○ A: $f(x)g(x) - \int g(x)f'(x)\,dx$ ○ B: $f(x)g(x) + \int g(x)f'(x)\,dx$

○ C: $f(x)g(x) - \int g'(x)f(x)\,dx$ ○ D: $f(x)g(x) + \int g'(x)f(x)\,dx$

2. **$\int \cot x\,dx$ = ?**

○ A: ln |cos x| + c ○ B: ln |sec x| + c

○ C: ln |sin x| + c ○ D: ln |cosec x| + c

3. $\int_0^{3\pi/2} cos(x)dx \ = ?$

○ A: 0 ○ B: 1

○ C: 3 ○ D: -1

4. $\int \frac{\tan\sqrt{x}}{\sqrt{x}}\,dx =$

○ A: ln |cos √x| ○ B: 2 ln |cos √x|

○ C: ln |sec √x| ○ D: 2 ln |sec √x|

5. **The solution of the differential equation dy/dx = 2xy is?**

○ A: $y = ce^{-x^2}$ ○ B: $y = ce^{x^2}$

○ C: $y^2 = 2x^2 + c$ ○ D: None of the above.

6. $\int_0^{\pi} sin(x)dx \ = ?$

○ A: 0 ○ B: 1

○ C: 2 ○ D: √2

7. **$\int (3x^2 - 2x + 1)\,dx$ = ?**

○ A: $x^3 - x^2 + 1 + c$ ○ B: $x^3 - x + 1 + c$

○ C: $x^3 - x^2 + x + c$ ○ D: $x^3 + x^2 + x + c$

$\int \sec x \tan x\,dx$ =?

○ A: tan x + c ○ B: cot x + c

○ C: cosec x + c ○ D: sec x + c

8. $\int_{-2}^{3} x^2 dx \ = ?$

○ A: 8/3 ○ B: 19/3

○ C: 28/3 ○ D: 35/3

9. If $f(x) = x^2$ then find dy when x = 3 and dx = 0.01?

○ A: 0.02
○ B: 0.04
○ C: 0.06
○ D: 0.08

10. $\int tan^2 x\, dx \ \ =?$

○ A: $2 \tan x \sec^2 x + c$
○ B: $\tan x + x + c$
○ C: $\tan x - x + c$
○ D: None of the above.

11. $\int [f(x)]^{-1} f'(x)dx = ?$ **(f(x) > 0)**

○ A: $f(x) + c$
○ B: $\ln | \ln f(x) | +c$
○ C: $\ln f(x) + c$
○ D: $[f(x)]^{n+1} / (n+1)$

12. $\int_1^2 (2x^5 - x + 3)dx \ \ =?$

○ A: 45/2
○ B: 39/2
○ C: 17/2
○ D: None of the above.

13. $\int dx/(ax + b) =?$

○ A: $\ln|ax + b| + c$
○ B: $1/a \ln|ax + b| + c$
○ C: $1/b \ln|ax + b| + c$
○ D: $1/a \ln|a| + c$

14. Which of the following mathematical function gives the area under the curve?

○ A: Differentiation
○ B: Integration
○ C: Vector product
○ D: Both B and C.

15. $\int x\, sinx\, dx \ \ =?$

○ A: $x \sin x + \cos x + c$
○ B: $- x \sin x + \cos x + c$
○ C: $x \cos x + \sin x + c$
○ D: $- x \cos x + \sin x + c$

16. $\int \frac{x}{(1+x^4)} dx =$

○ A: $\tan^{-1} x^2 + c$
○ B: $1/2 \tan^{-1} x^2 + c$
○ C: $\cot^{-1} x^2 + c$
○ D: $1/2 \cot^{-1} x^2 + c$

17. $\int (2x + 3)^{1/2} dx = ?$

○ A: $1/3 (2x + 3)^{3/2} + c$
○ B: $1/2 (2x + 3)^{3/2} + c$
○ C: $1/3 (2x + 3)^{1/2} + c$
○ D: $2/3 (2x + 3)^{3/2} + c$

18. $\int \tan x \sec^2 x\, dx = ?$

○ A: $\sec^2 x / 2 + c$
○ B: $\tan^2 x / 2 + c$
○ C: $\tan^2 x$
○ D: $1/2 (\cos x)^2$

19. What is the solution of the equation?

(sin y) (cosec x) dy/dx = 1

○ A: sin y = sin x + c
○ B: sin y = - sin x + c
○ C: cos y = cos x + c
○ D: cos y = - cos x + c

TEST 2

1. $\int \frac{1-x^2}{1+x^2}dx$ = ?

○ A: x + Tan^{-1} x + c
○ B: x - Tan^{-1} x + c
○ C: -x + 2Tan^{-1} x + c
○ D: -x - 2Tan^{-1} x + c

2. $\int_1^4 \left(\sqrt{x}+\frac{1}{\sqrt{x}}\right) dx \ =?$

○ A: 20/3
○ B: 14/3
○ C: 8/3
○ D: 5/3

3. **The family of curve y = Ax + A^3 is represented by the differential equation of degree?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

4. $\int \frac{\cos x - \sin x}{\cos x + \sin x} dx \ =?$

○ A: - ln (cos x - sin x) + c
○ B: - ln (cos x + sin x) + c
○ C: ln (cos x - sin x) + c
○ D: ln (cos x + sin x) + c

5. $\int \frac{\cos x}{\sqrt{1+\sin x}} dx$ = ?

○ A: - $(1+\sin x)^{1/2}$ + c
○ B: $2(1+\sin x)^{1/2}$ + c
○ C: $0.5\ (1+\sin x)^{1/2}$ + c
○ D: - $0.5\ (1+\sin x)^{1/2}$ + c

6. **$\int a^{\lambda x + y}$ dx =?**

○ A: $1/(\lambda \ln a)\ a^{\lambda x + y}$ + c
○ B: $1/(\ln a)\ a^{\lambda x + y}$ + c
○ C: $1/(\lambda \ln a)\ a^{x + y}$ + c
○ D: $1/(\ln a)\ a^{x + y}$ + c

7. **The order of a differential equation whose solution is y = a cos x + b sin x, where a and b are arbitrary constants, is?**

○ A: 1
○ B: 2
○ C: 3
○ D: Cannot be determined.

8. **$\int$ x ln x dx = ?**

○ A: $0.5\ x^2$ (ln x - 0.5) + c
○ B: x^2 (ln x + 0.5) + c
○ C: 1.5 x (ln x + 1) + c
○ D: x^2 (ln x - x) + c

9. **The order and the degree of the differential equation $d^2s/dt^2 + 4 = 0$ are?**

○ A: Order is 2 and degree is 2
○ B: Order is 2 and degree is 3
○ C: Order is 1 and degree is 2
○ D: None of the above.

10. **$\int$ ln (tan x) $\sec^2$ x dx = ?**

○ A: ln (tan x) + tan x + c
○ B: tan x ln (tan x) - tan x + c
○ C: ln (tan x) - sec x + c
○ D: tan x ln (tan x) + tan x + c

11. $\int \frac{1-\tan^2 x}{1+\tan^2 x} dx =$

○ A: sin 2x
○ B: 1/2 sin 2x
○ C: cos 2x
○ D: 1/2 cos 2x

12. The solution of the differential equation $\frac{dy}{dx} + \frac{1+\cos 2y}{1-\cos 2x} = 0$ is

○ A: tan y + cot x = c
○ B: tan y . cot x = c
○ C: tan y - cot x = c
○ D: tan y = c . cot x

13. Which of the following is an ordinary differential equation?

○ A: $2y + 8x = \frac{d(cosx)}{dx}$
○ B: $\frac{d(y+x)}{dx} = x^2 + sin\,x$
○ C: $\frac{d(cos\,x + tan\,x)}{dx} = x + 2y$
○ D: All of the above.

14. $\int$ **sec²x cosec²x dx = ?**

○ A: tan x cot x
○ B: tan x + cot x
○ C: tan x - cot x
○ D: - tan x cot x

15. $\int$ **tan² x dx = ?**

○ A: tan x + x + c
○ B: tan x - x + c
○ C: $\sec^2$ x - x + c
○ D: cosec^2 x + x + c

16. $\int \frac{1}{(1+x^2)Tan^{-1}x} dx \quad =?$

○ A: 1/x ln |Tan^{-1} x| + c
○ B: -1/x ln |Tan^{-1} x| + c
○ C: - ln |Tan^{-1} x| + c
○ D: ln |Tan^{-1} x| + c

17. The solution of the differential equation y dy/dx = x - 1, satisfying x = 1 and y = 1, is?

○ A: $y^2 = 2x^2 - x – 1$
○ B: $y^2 = x^2 - 2x + 2$
○ C: $y = x^2 - 2x + 3$
○ D: $y^2 = 2x^2 - x - 3$

18. $\int ln\,x\,dx \quad =?$

○ A: x (1 – ln x) + C
○ B: x (ln x - 1) + C
○ C: (1 + x) ln x + C
○ D: (1 - x) ln x + C

19. A particle moves in a straight line with a velocity given by dx/dt = x + 1 (x is the distance described). The time taken by a particle to traverse a distance of 99 meters is?

○ A: log 10e
○ B: 2 $\log_e$ 10
○ C: 2 log 10 e
○ D: 0.05 log10 e

20. The number of arbitrary constants in the second order differential euqation is?

○ A: 0
○ B: 1
○ C: 2
○ D: Infinite

TEST 3

1. $\int \frac{cos2x - 1}{1 + cos2x}dx \ \ =?$

○ A: - tan x + x + c
○ B: tan x + x + c
○ C: x - sec x + c
○ D: x + sec x + c

2. $\int e^{-ln\,x}\,dx \ \ =?$

○ A: $e^{-\ln x}$
○ B: ln |x|
○ C: $-e^{-\ln x}$
○ D: $-x\,e^{-\ln x}$

3. $\int_0^1 \frac{dx}{(1 + x^2)^{3/2}} \ \ =?$

○ A: 1
○ B: √2
○ C: 1/√2
○ D: 3/√2

4. The solution of the equation $(e^x + 1)y\ dy = (y + 1)e^x\ dx$ is ?

○ A: $y = e^x(e^x + 1) + C$
○ B: $(y + 1) = e^{2x} + C$
○ C: $y = e^x / x + C$
○ D: $C\ (1 + y)(1 + e^x) = e^y$

5. The differential equation of all circles of radius 'r' is of order?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. What is the solution of the differential equation,

$(x\sqrt{1 + y^2})dx + (y\sqrt{1 + x^2})dy = 0$

○ A: $(1+y^2)^{1/2} + (1 + x^2)^{1/2} = c$
○ B: $\log(1 + y^2) + \log(1 + x^2) = 2c$
○ C: $\sin^{-1} y + \sin^{-1} x = c$
○ D: $\tan^{-1} y + \tan^{-1} x = c$

7. $\int \frac{e^{tan^{-1}x}dx}{1 + x^2}$ **= ?**

○ A: $xe^{tan^{-1}x} + c$
○ B: $(tan^{-1}x)e^{tan^{-1}x} + c$
○ C: $tan^{-1}x + c$
○ D: $e^{tan^{-1}x} + c$

8. $\int_0^{2\pi} cos^2\theta\,d\theta \ \ =?$

○ A: π
○ B: 2π
○ C: 3π/2
○ D: 3

9. $\int_0^{\pi} \sqrt{1 + sin\ x}\,dx \ \ =?$

○ A: 2
○ B: 4
○ C: √2
○ D: 2√2

10. $\int |x|\, dx = ?$

○ A: $x^2 / 2$ ○ B: $- x^2 / 2$

○ C: $x\,|x| / 2$ ○ D: 1

11. $\int \frac{\sec x \operatorname{cosec} x}{\log \tan x} dx =$

○ A: log [log tan x] + C ○ B: cot (log x) + C

○ C: tan (log x) + C ○ D: None of the above.

12. If $\int x^6 \sin(5x^7) dx = \frac{k}{5} \cos(5x^7),\ x \neq 0$, then

○ A: k = -1/7 ○ B: k = 1/7

○ C: k = -7 ○ D: k = 7

13. $\int \frac{dx}{e^x + e^{-x}} \ = ?$

○ A: $\log (e^x + 1) + C$ ○ B: $\log (e^x + e^{-x}) + C$

○ C: $\tan^{-1} e^x + C$ ○ D: $\sin^{-1} e^x + C$

14. The value of $\int \frac{(x - x^3)^{1/3}}{x^4} dx$ is

○ A: $(3/8)\,(1/x^2 - 1)^{4/3} + C$ ○ B: $- (3/8)\,[(1/x^2) - 1]^{4/3} + C$

○ C: $(1/8)\,(1 - 1/x^2)^{4/3} + C$ ○ D: $- (1/8)\,(1 - 1/x^2)^{4/3} + C$

15. $\int \frac{\cos x}{\sin x \,.\, \ln \sin x} dx \ = ?$

○ A: - ln |ln sin x| dx ○ B: - ln |ln cos x| dx

○ C: ln |ln sin x| dx ○ D: ln |ln cos x| dx

16. $\int_0^{2\pi} \sqrt{1 + \sin(x/2)}\, dx \ = ?$

○ A: 2 ○ B: 4

○ C: 8 ○ D: 0

17. $\int \sin^{-1} x\, dx \ = ?$

○ A: $x \cos^{-1} x + (1 - x^2)^{1/2} + C$ ○ B: $x \sin^{-1} x + C$

○ C: $x \sin^{-1} x + (1 - x^2)^{1/2} + C$ ○ D: $- \sin^{-1} x + (1 - x^2)^{1/2} + C$

18. $\int_0^{\pi/2} \sin x\, e^{\cos x} dx \ = ?$

○ A: 1 ○ B: e - 1

○ C: e ○ D: -1

19. $\int \frac{xe^x}{(1+x)^2}dx \ =?$

○ A: $(1 + 2x\, e^x) / (1 + x)$ ○ B: $(1 - 2x\, e^x) / (1 + x)$

○ C: $- e^x / (1+x)$ ○ D: $e^x / (1+x)$

20. The equation of the curve through the point (1, 0) and whose slope is $\frac{y-1}{x^2-x}$ is

○ A: $(y - 1)(x + 1) + 2x = 0$ ○ B: $2x(y - 1) + x + 1 = 0$

○ C: $x(y - 1)(x + 1) + 2 = 0$ ○ D: $y(y - 1)(x - 1) + 2 = 0$

TEST 4

1. $\int \sqrt{1 + cos(x/4)}\, dx \ =?$

○ A: $8 \sqrt{2} \sin (x/8) + C$ ○ B: $- 8 \sqrt{2} \sin (x/8) + C$

○ C: $8 \sqrt{2} \cos (x/8) + C$ ○ D: $- 8 \sqrt{2} \cos (x/8) + C$

2. $\int_0^{\pi/2} sin^2 x\, dx \ =?$

○ A: π ○ B: $\pi/2$

○ C: $\pi/3$ ○ D: $\pi/4$

3. $\int_0^{\pi} \sqrt{1 - cos\, x}\, dx \ =?$

○ A: 1 ○ B: $\sqrt{2}$

○ C: $2\sqrt{2}$ ○ D: 2

4. $\int_0^{\pi/2} sin(x) sin(2x) dx \ =?$

○ A: 1/3 ○ B: 2/3

○ C: 1 ○ D: pi

5. Which of the following statement is false?

○ A: The degree of the differential equation is the highest power of the highest order differential coefficient occurring in it.

○ B: The order of the differential equation is the highest order derivative occurring in the equation.

○ C: The order of a differential equation is unique.

○ D: The order of a differential equation is any integer.

6. $\int \cos \sqrt{x}\, dx = ?$

○ A: $[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$ ○ B: $2[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + C$

○ C: $[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$ ○ D: $2[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + C$

7. The differential equation $x\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y = x^2$ is of

○ A: Degree 4 and order 2
○ B: Degree 4 and order 3
○ C: Degree 3 and order 2
○ D: Degree 2 and order 3

8. What is the solution of the differential equation?

$x\,dy + y(x - 1)dx = 0$

○ A: $y = c\,xe^{x}$
○ B: $y = c\,xe^{-x}$
○ C: $y = c\,e^{-x}$
○ D: $y = c\,xe^{x+1}$

9. $\int [f(x)]^n f'(x)\,dx = ?$

○ A: ln f(x) + c
○ B: - ln f(x) + c
○ C: $[f(x)]^{n+1} / (n+1)$
○ D: $[f(x)]^{n} / (n+1)$

10. $\int x^2e^{x^3} \cos(e^{x^3})dx$ is equal to

○ A: $\frac{1}{3}sin(e^{x^3}) + c$
○ B: $sin(e^{x^3}) + c$
○ C: $3sin(e^{x^3}) + c$
○ D: $-sin(e^{x^3}) + c$

11. If dr/dt = - rt and $r(0) = r_0$, then which of the following is correct?

○ A: $r = r_oe^{-t}$
○ B: $r = r_oe^{-t/2}$
○ C: $r = r_oe^{-t.t}$
○ D: $r = r_oe^{-t.t/2}$

12. $\int \frac{e^{2x} + e^{x}}{e^{x}}dx \ =?$

○ A: $e^x + 1 + c$
○ B: $2x\,e^x + c$
○ C: $e^{2x} + 1 + c$
○ D: $e^x + x + c$

13. δy for any function f(x) is given by?

○ A: f(δx)
○ B: f(x + δx)
○ C: f(x + δx) + f(x)
○ D: f(x + δx) - f(x)

14. $\int_0^{\pi/2} cos^2x\,dx \ =?$

○ A: π
○ B: π/2
○ C: π/3
○ D: π/4

15. The solution of the equation y dx + x dy = 0 is?

○ A: xy = c
○ B: x/y = c
○ C: x + y = c
○ D: x - y = c

Analytic Geometry

TEST 1

1. Equation of a line parallel to x axis at a distance 'a' below the x axis is?

○ A: $x = a$ ○ B: $x = - a$

○ C: $y = - a$ ○ D: $y = a$

2. What is the equation of a line perpendicular to a line with slope = -6? The line has y intercept of 4/3.

○ A: $y = \ x + 8$ ○ B: $y = -6x + 4/3$

○ C: $6y = x + 8$ ○ D: $y = x + 3/4$

3. The angle bisectors of a triangle are?

○ A: Perpendicular ○ B: Concurrent

○ C: Non-concurrent ○ D: Parallel

4. The equation of family of lines perpendicular to line $3x + 4y + 7 = 0$, is?

○ A: $4x + 3y + k = 0$ ○ B: $4x - 3y + k = 0$

○ C: $3x - 4y + k = 0$ ○ D: $3x + 4y + k = 0$

5. If m_1 and m_2 are the slopes of the perpendicular lines. Which of the following is true?

○ A: $m_1 = m$ ○ B: $m_1 = - m_2$

○ C: $m_1m_2 -1 = 0$ ○ D: $m_1m_2 +1 = 0$

6. Angle between lines $2x^2 - 7xy + 3y^2 = 0$, is?

○ A: 45° ○ B: 60°

○ C: 90° ○ D: 30°

7. What is the distance between the points A (7,5) and B (2,-6) ?

○ A: $\sqrt{73}$ ○ B: $\sqrt{146}$

○ C: $\sqrt{183}$ ○ D: $\sqrt{219}$

8. Equation of x axis is?

○ A: $y = 0$ ○ B: $x = 0$

○ C: $x = y$ ○ D: $y = 1$

9. What is the y intercept of the line $x - \sqrt{3}y + 10 = 0$

○ A: $10/\sqrt{3}$ ○ B: $-10/\sqrt{3}$

○ C: 10 ○ D: -10

10. The mid point of line joining points A (3 ,1) and B(-2,-4) is?

○ A: (5/2 , 5/2) ○ B: (3/2, 1/2)

○ C: (-1, -2) ○ D: (1/2 , -3/2)

11. If inclination of a line is 45° then the slope is?

○ A: 0 ○ B: 1

○ C: -1 ○ D: Infinity.

12. The point (-4,-2) lies on a circle. What is the length of the radius of this circle if the center is located at (-8,-10)?

○ A: $\sqrt{47}$
○ B: $\sqrt{80}$
○ C: $\sqrt{95}$
○ D: $\sqrt{108}$

13. If two medians of a triangle ABC pass through point (1,-2) then the third median pass through?

○ A: (0,0)
○ B: (-2,1)
○ C: (-1,-2)
○ D: None of the above.

14. Which of the following statement is true about any triangle?

○ A: Altitudes and right bisectors are concurrent.
○ B: Altitudes and right bisectors are non-concurrent.
○ C: Altitudes are concurrent and right bisectors are not concurrent.
○ D: Altitudes are not concurrent and right bisectors are concurrent.

15. If m_1 and m_2 are the slopes of two lines then the tangent of angle between the lines is equal to?

○ A: $(m_2 - m_1) / (1 - m_1m_2)$
○ B: $(m_2 + m_1) / (1+m_1m_2)$
○ C: $(m_2 + m_1) / (1 - m_1m_2)$
○ D: $(m_2 - m_1) / (1+m_1m_2)$

16. In the straight equation x cos a + y sin a = P, P represents?

○ A: Y intercept
○ B: X intercept
○ C: Mid point of the line.
○ D: Length of perpendicular from the origin to the line

17. What is the point of intersection for 5x + 7y = 35 and 3x - 7y = 21?

○ A: (5,7)
○ B: (7,0)
○ C: (3,-7)
○ D: (4,3)

18. If points A(a,b) ; B(c,d) and C(e,f) are collinear. Then the area of the triangle ABC is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

19. The point p (x,y) such that x>0 and y <0 lies in?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

20. What is the slope of the line ax + by + c = 0?

○ A: 0
○ B: Infinite
○ C: -c/b
○ D: -a/b

TEST 2

1. **What is the symmetric form of the equation 5x - 12y + 39 = 0?**

○ A: $\frac{x+39/5}{12/13} = \frac{y}{5/13}$

○ B: $(-5/13)x + (12/13)y = 3$

○ C: $(-5/39)x + (12/39)y = 1$

○ D: $y = (5/12)x + (39/12)$

2. **The equation of line parallel to x-axis and bisecting the join of (1, 4) and (− 2, 6) is?**

○ A: $y = 3$

○ B: $y = 5$

○ C: $y + 2 = 5$

○ D: $x = 5$

3. **What is the equation of a line passing through the point (4,2) and parallel to the line connecting points (0,-1) and (7,-15)?**

○ A: $y + 2x + 10 = 0$

○ B: $y + 2x - 10 = 0$

○ C: $2y + 3x - 7 = 0$

○ D: $2y + 3x + 7 = 0$

4. **The two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if?**

○ A: $a_1b_2 - a_2b_1 = 0$

○ B: $a_1a_2 - b_1b_2 = 0$

○ C: $a_1b_2 + a_2b_1 = 0$

○ D: $a_1a_2 + b_1b_2 = 0$

5. **The three lines $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if and only if?**

○ A: $a_1 = a_2 = a_3$ and $b_1 = b_2 = b_3$ and $c_1 = c_2 = c_3$

○ B: $a_1 + b_1 + c_1 = 0$

○ C:

○ D:

6. **If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then?**

○ A: a = 0, b = 4

○ B: a = 3, b = 4

○ C: a = 2, b = 3

○ D: a = 3, b = 5

7. **The equation of general form $ax^2 + 2hxy + by^2$ represents?**

○ A: A line

○ B: A curve

○ C: A pair of lines

○ D: A pair of lines through the origin

8. **Centroid of a triangle divides each median in the ratio?**

○ A: 1:1

○ B: 1:2

○ C: 2:1

○ D: 1:3

9. **Find the radius of a circle whose diameter has endpoints (-3, -2) and (7, 8)?**

○ A: $10\sqrt{2}$

○ B: $2\sqrt{10}$

○ C: $5\sqrt{2}$

○ D: $2\sqrt{5}$

10. **The angle between the pair of lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$ is?**

○ A: None of the above.

○ B: $\tan^{-1}(4/3)$

○ C: $\tan^{-1}(11/3)$

○ D: $\tan^{-1}(7/3)$

11. Of $P_1(x_1,y_1)$ and $P_2=(x_2,y_2)$ are two points such that line joining P_1P_2 is parallel to x axis then?

○ A: $x_1 = x_2$
○ B: $y_1 = x_2$
○ C: $x_1 = y_2$
○ D: $y_1 = y_2$

12. The equation of a straight line that intersects x axis at point 2 and y axis at point -4 is?

○ A: $y - 2x + 4 = 0$
○ B: $y - 2x - 4 = 0$
○ C: $2x - y + 4 = 0$
○ D: $x - 2y + 4 = 0$

13. For a pair of lines represented by general equation $ax^2 + 2hxy + by^2$, if $h^2 > ab$ then?

○ A: Lines are real and distinct.
○ B: Lines are real and coincident.
○ C: Lines are imaginary.
○ D: Lines do not pass through the origin.

14. What is the equation of the line intersecting $3x - 4y - 10 = 0$ and $x + 2y - 10 = 0$ and having a zero slope?

○ A: $2x + 3y - 18 = 0$
○ B: $y = 2$
○ C: $x = 9$
○ D: $2x + 3y + 18 = 0$

15. Slope of a line is negative if the angle z it froms with the x axis is?

○ A: $z = 0$
○ B: $z > 90$
○ C: $0 < z < 90$
○ D: $90 < z < 180$

16. If three points A(a,b), B(c,d) and C(e,f) are collinear then?

○ A: Slope of AB is not equal to the slope of BC
○ B: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$
○ C: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 1$
○ D: None of the above.

17. The equation below shows which form of the straight line equation?

$$\frac{x - x_1}{\cos\alpha} = \frac{y - y_1}{\sin\alpha}$$

○ A: Normal form
○ B: Two point form
○ C: Symmetric form
○ D: Point slope form

18. What is the distance between two parallel lines $2x - 5y + 13 = 0$ and $2x - 5y + 6 = 0$?

○ A: 3/28
○ B: 9/32
○ C: $7/\sqrt{29}$
○ D: $4/\sqrt{63}$

19. What is the normal form of the straight line equation $5x - 12y + 39 = 0$?

○ A: This equation cannot be represented in the two point form.
○ B: $y = (5/12)\, x + 39/12$
○ C: $(-5/39)\, x + (12/39)\, y = 1$
○ D: $(-5/13)\, x + (12/13)\, y = 3$

20. The points of line $|x| = |y|$ may lie in which quadrant?

○ A: Quadrant I
○ B: Quadrant I & III
○ C: Quadrant II and IV
○ D: Quadrant I, II , III or IV

TEST 3

1. **Find the value of k in the equation (3x - 4y - 10) + k(x + 2y - 10) = 0 such that the line is perpendicular to a line with slope 3/4?**

○ A: 4 ○ B: 5

○ C: 6 ○ D: 7

2. **The pair of lines represented by the equation $2x^2 + 49xy - 2y^2$are?**

○ A: Imaginary. ○ B: Parallel

○ C: Perpendicular ○ D: None of the above.

3. **The straight lines given below form what kind of triangle?**

x + y - 4 = 0, 3x + y - 4 = 0, x + 3y - 4 = 0

○ A: Isoceles ○ B: Equlateral

○ C: Right angled ○ D: None of the above.

4. **Pair of lines represented by the equation $2x^2 + 8xy + 8y^2$ are?**

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imginary. ○ D: None of the above.

5. **What is the value of h such that points (-1,h) , (3,2) and (7,3) are collinear?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. **The lines px + qy + r = 0, qx + ry + p = 0, rx + py + q = 0 are concurrent if?**

○ A: $p + q + r = 0$ ○ B: $p^2 + q^2 + r^2 + pq + qr + rp = 0$

○ C: $p^2 + q^2 + r^2 + 3pqr = 0$ ○ D: All of the above.

7. **The equation of base of an equilateral triangle is x + y = 2 and the vertex opposite to this base is (2, − 1). Then the length of the side of triangle equals?**

○ A: √3 ○ B: √1 / √3

○ C: √2 / √3 ○ D: √3 / √2

8. **For a pair of Imaginary lines represented by the equation $ax^2 + 2hxy + by^2$. Which of the following is true?**

○ A: The imaginary lines never intersect.

○ B: They intersect at (0,0) ○ C: They intersect at postivie y axis.

○ D: They intersect at negative y axis.

9. **If vertices of triangle ABC are A(2,2), B(-4,-4) and C(5,-8). Then the length of median through C is?**

○ A: √65 ○ B: √75

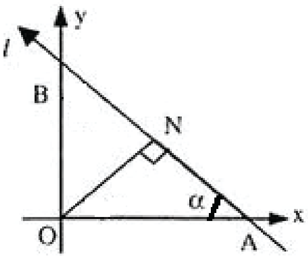
○ C: √85 ○ D: √95

10. **For a pair of lines represented by the equation $3x^2 + 4xy + 9y^2$, the lines are?**

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imaginary. ○ D: Not passing through the origin.

11. What the equation of a line at a distance 5 units from the origin, having angle $\alpha = 30^o$ as shown in the figure below?



○ A: $\sqrt{3}x + y = 10$
○ B: $x + \sqrt{3}y = 10$
○ C: $\sqrt{3}x + y = 5$
○ D: $x + \sqrt{3}y = 5$

12. Which of the following is true about the two points (0,0) and (-4,7) with respect to the line $2x - 3y + 6 = 0$?

○ A: They both lie on the line.
○ B: They both lie above the line.
○ C: They both lie below the line.
○ D: They lie on the opposite sides of the line.

13. What is the radius of circle inscribed in the triangle formed by lines $x = 0$, $y = 0$ and $4x + 3y - 24 = 0$?

○ A: 2
○ B: $2\sqrt{2}$
○ C: 3
○ D: 4

14. Equation of the right bisector of the line segment joining points (7,4) and (-1,-2) is?

○ A: $4x + 3y - 10 = 0$
○ B: $4x + 3y - 15 = 0$
○ C: $3x - 4y + 7 = 0$
○ D: $3x - 4y - 7 = 0$

15. The line segment joining the point (-3,-4) and (1,-2) is divided by the y axis in ratio?

○ A: 1:1
○ B: 2:1
○ C: 3:1
○ D: 4:1

16. If the coordinates of the mid point of the triangle are (1,-1), (2,3) and (3,2) then the area of triangle is?

○ A: 3/2
○ B: 9/2
○ C: 6
○ D: 11/2

17. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form which of the following triangles?

○ A: Isoceles
○ B: Equilateral
○ C: Right Angled
○ D: None of the above.

18. Points A(1, 3) and C(5, 1) are opposite vertices of a rectangle ABCD. If the slope of BD is 2, then its equation is

○ A: $2x - y = 4$
○ B: $2x + y = 4$
○ C: $2x + y = 7$
○ D: $2x - y = -7$

19. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product then c has the value?

○ A: -1
○ B: 1
○ C: -2
○ D: 2

20. Equation of the line passing through the point (1,-2) and cutting off equal intercepts from the axis would be?

○ A: $x + y = 1$
○ B: $x + y + 1 = 0$
○ C: $x - y = 1$
○ D: $x - y + 1 = 0$

TEST 4

1. For a pair of lines represented by the equation $ax^2 + 2hxy + by^2$, which of the following is true if the lines are parallel?

○ A: $h^2 = 0$
○ B: $h^2 > ab$
○ C: $h^2 < ab$
○ D: $h^2 - ab = 0$

2. If point A (-1,2) is the center of a circle and point B (7,5) lies on the circle. The diameter of circle is?

○ A: 9
○ B: $\sqrt{45}$.
○ C: $\sqrt{73}$.
○ D: $2\sqrt{73}$

3. The coordinate axis is changed through the point O' (2,3). If coordinates of a point P in new axis are (-1,4) then the original coordinates of P were?

○ A: (0,0)
○ B: (2,3)
○ C: (1,7)
○ D: (3,-1)

4. The point P (x,y) with $x<0$ and $y<0$ lies in which quadrant?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

5. What are the new coordinates of the point P(5,3), if the axis is rotated by angle 45°?

○ A: (4,2)
○ B: $(\sqrt{2}, 2\sqrt{2})$
○ C: $(2\sqrt{2}, -\sqrt{2})$
○ D: $(4\sqrt{2}, -\sqrt{2})$

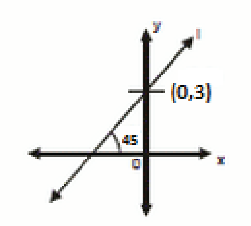
6. Inclination of the line $y = -x$ is?

○ A: 45°
○ B: 135°
○ C: 225°
○ D: 315°

7. What is the angle between the lines L_1 joining points (1,-7) and (6,-4) and L_2 joining points (-1,2) and (-6,-1)?

○ A: 0
○ B: 30
○ C: 45
○ D: 60

8. The equation of the line given below is?



○ A: $y = 3x - 1$
○ B: $y = 3x + 1$
○ C: $y + x = 3$
○ D: $y = x + 3$

9. **Two sides of an isosceles triangle are given by the equation $7x - y + 3 = 0$ and $x + y - 3 = 0$. If its third side passes through the point (1, – 10), then its equations are**

○ A: x - 3y - 31 = 0 or 3x + y + 7 = 0 ○ B: x - y - 31 = 0 or x + y + 7 = 0

○ C: 2x - 3y - 11 = 0 or x + 4y + 9 = 0 ○ D: x + y + 1 = 0 or 5x - y + 10 = 0

10. Equation of the line through the point (2,3) and perpendicular to the line joining (-5,6) and (-6,5) is given by?

○ A: x - y + 5 = 0 ○ B: x + y + 5 = 0

○ C: x - y - 5 = 0 ○ D: x + y - 5 = 0

11. The extremities of diagonal of a parallelogram are the points (3, − 4) and (− 6, 5). If the third vertex is (− 2, 1), then the fourth vertex will be?

○ A: (0,1) ○ B: (1,0)

○ C: (1,1) ○ D: (-1,0)

12. Orthocenter of a triangle is defined as the point of intersection of?

○ A: Altitudes ○ B: Angle bisectors

○ C: Medians ○ D: None of the above.

13. If the lines represented by equation $Ax^2 + 2Hxy + By^2 = 0$ are perpendicular, then?

○ A: A + H = 0 ○ B: A + B = 0

○ C: H = 0 ○ D: A/B = H/B

14. What is the equation of the lines passing through the point (-5,-3) and (9,-1) ?

○ A: x - 7y - 16 = 0 ○ B: x - 7y + 16 = 0

○ C: x + 7y + 16 = 0 ○ D: x + 7y - 20 = 0

15. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. Then PQRS must be a?

○ A: General parallelogram ○ B: Rectangle

○ C: Rhombus ○ D: None of the above.

16. A line passes through point (4, 1) and is perpendicular to line 3x + y = 3, then its x − intercept is?

○ A: ½ ○ B: 2/3

○ C: 1 ○ D: 3/2

17. The line passing through point (1,2) and perpendicular to x + y + 1 = 0 is?

○ A: y - x + 1 = 0 ○ B: y - x - 1 = 0

○ C: y - x + 2 = 0 ○ D: y - x - 2 = 0

18. Distance between two lines defined by x + 3 = 0 and x - 3 = 0 is?

○ A: 0 ○ B: 3

○ C: 6 ○ D: 9

19. M is the midpoint of line AB. The coordinates of A are (-2,3) and the coordinates of M are (1,0). The coordinates of B are?

○ A: (-1/2,3/2) ○ B: (4,-3)

○ C: (4,6) ○ D: (-4,-3)

20. If a line passing through the points (x_1, y_1) and (x_2, y_2) such that $x_1 = x_2$ then the slope of the line is?

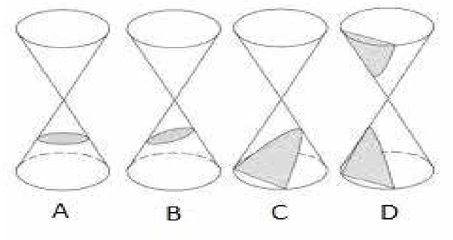
○ A: Zero ○ B: Positive

○ C: Negative ○ D: Undefined

Conic Sections

TEST 1

1. **Which of the following cutting of a cone represents a circle?**



○ A: A
○ B: B
○ C: C
○ D: D

2. **Eccentricity of ellipse is?**

○ A: Equal to 1.
○ B: Greater than zero and less than 1.
○ C: Greater than one.
○ D: Zero

3. **Center and radius of the circle represented by $x^2 + y^2 = 9$ is?**

○ A: (1,1) and 9
○ B: (1,1) and 3
○ C: (0,0) and 9
○ D: (0,0) and 3

4. **Equation of a circle cannot have a term?**

○ A: x
○ B: y
○ C: xy
○ D: All of the above.

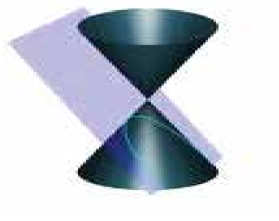
5. **The center of the circle represented by the equation $(x - 3)^2 + (y + 4)^2 = 4$ is?**

○ A: (3,4)
○ B: (-3,-4)
○ C: (-3,4)
○ D: (3,-4)

6. **What is the focus of the ellipse $x^2/16 + y^2/4 = 1$?**

○ A: $(\pm 2\sqrt{3}, 0)$
○ B: $(\pm \sqrt{3}, 0)$.
○ C: $(\pm 2\sqrt{5}, 0)$.
○ D: $(\pm \sqrt{5}, 0)$.

7. **The plane cutting a double cone as shown in the figure below would get a/an?**

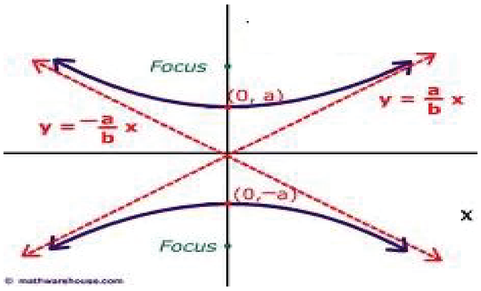


○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

8. **The equation $x^2/a^2 + y^2/b^2 = 1$ represents a verticle ellipse if?**

○ A: $a^2 = b^2$
○ B: $a^2 < b^2$
○ C: $a^2 > b^2$
○ D: None of the above.

9. The equation of the given hyperbola is of form?



○ A: $x^2/a^2 + y^2/b^2 = 1$

○ B: $x^2/b^2 + y^2/a^2 = 1$

○ C: $x^2/a^2 - y^2/b^2 = 1$

○ D: $y^2/a^2 - x^2/b^2 = 1$

10. When the cutting of a conic section is parallel to the axis of the cone and intersects both nappes, it represents a/an?

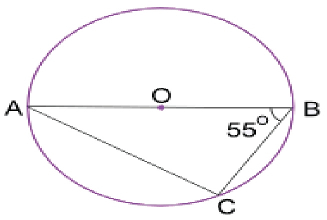
○ A: Circle

○ B: Parabola

○ C: Hyperbola

○ D: Ellipse

11. What is angle CAB in the given figure?



○ A: 35°

○ B: 45°

○ C: 55°

○ D: 65°

12. A line y = mx + c intersects a circle $x^2 + y^2 = a^2$. The point of intersection are imaginary if?

○ A: $a^2 (1+m^2) - c^2 > 0$

○ B: $a^2 (1+m^2) - c^2 = 0$

○ C: $a^2 (1+m^2) - c^2 < 0$

○ D: Intersection points are never imaginary.

13. If a circle is represented by the equation $x^2 + y^2 + 4x - 6y - 12 = 0$. Then the point (-5,6) is?

○ A: Inside the circle

○ B: Outside the circle.

○ C: On the circle.

○ D: Center of the circle.

14. Circle is a special case of ellipse with eccentricity = ?

○ A: -1

○ B: 0

○ C: 1

○ D: 2

15. The parametric form of equation $(a \cos \Theta, b \sin \Theta)$ is for?

○ A: Circle

○ B: Hyperbola

○ C: Ellipse

○ D: Parabola

16. Equation of the directrices of hyperbola $y^2/a^2 - x^2/b^2 = 1$ is given by?

○ A: $x = \pm c/e^2$

○ B: $x = \pm b/e$

○ C: $y = \pm c/e^2$

○ D: $y = \pm b/e$

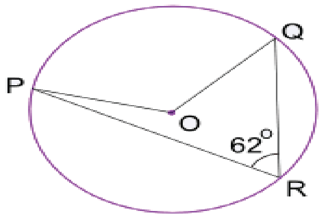
17. If $e > 1$ then the conic section is a?

○ A: Parabols
○ B: Ellipse
○ C: Hyperbola
○ D: Circle.

18. If a plane cutting one section of a double cone is slightly tilted and not parallel to the generator of the cone, we get a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

19. What is the angle POQ in the given diagram?



○ A: 62°
○ B: 102°
○ C: 124°
○ D: 132°

20. Focal chord perpendicular to the axis of the parabola is called?

○ A: Directrix.
○ B: Tangent Chord
○ C: Latusrectum.
○ D: Vertex.

TEST 2

1. **For a general form of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius is given by**?

○ A: $g + f + c$
○ B: $\sqrt{g^2 + f^2}$
○ C: $\sqrt{g^2 + f^2 - c}$
○ D: $\sqrt{g^2 + f^2 + c}$

What is the eccentricity of the ellipse given by equation $x^2/9 + y^2/4 = 1$?

○ A: 5/3
○ B: √5/3
○ C: 2/3
○ D: √2/3

2. **The equations $x = at^2$, $y = at$; $t \in R$ represents?**

○ A: A circle
○ B: A parabola
○ C: A hyperbola
○ D: An ellipse

3. **Intersecting properties of conic sections were discovered by?**

○ A: Pythagoras
○ B: Eudoxus and Georg Cantor
○ C: Euclid
○ D: Apollonius and Pappus

4. **What are the coordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$?**

○ A: (2,-1)
○ B: (2,1)
○ C: (-2,-1)
○ D: (2,0)

5. **What is the focus of the parabola $4x - y^2 = 2y + 13$?**

○ A: (3,-1)
○ B: (3,1)
○ C: (4, 1)
○ D: (4, -1)

6. What are the foci of hyperbola $x^2/9 - y^2/4 = 1$?

○ A: $(\pm\sqrt{5}, 0)$
○ B: $(0, \pm\sqrt{5})$
○ C: $(0, \pm\sqrt{13})$
○ D: $(\pm\sqrt{13}, 0)$

7. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x-a)$ is?

○ A: 90°
○ B: 60°
○ C: 45°
○ D: 30°

8. Equation of a line tangent to ellipse at $x^2/a^2 + y^2/b^2 = 1$ at points (4,10) is?

○ A: $4x/a^2 + 10y/b^2 = 1$
○ B: $10x/a^2 + 4y/b^2 = 1$
○ C: $16x/a^2 + 100y/b^2 = 1$
○ D: $100x/a^2 + 16y/b^2 = 1$

9. The line $y = 2x + c$ is tangent to the ellipse $x^2/16 + y^2/4 = 1$ if c equals?

○ A: $\sqrt{29}$
○ B: $\sqrt{60}$
○ C: $\sqrt{68}$
○ D: $\sqrt{74}$

10. What is the center of the ellipse $x^2 + 4y^2 + 4x - 24y + 24 = 0$?

○ A: (-2,3)
○ B: (-2, -3)
○ C: (2,3)
○ D: (2,-3)

11. Which of the following is not an equation of a circle?

○ A: $x^2 + y^2 - x + 98y + 11 = 4$
○ B: $x^2 + y^2 + 18x + 98y + 11 = 0$
○ C: $5x^2 + 5y^2 + 14x + 12y - 10 = 0$
○ D: $x^2 + 3y^2 + 10x - 9y + 11 = 0$

12. Latusrectum of the parabola $y^2 = -4ax$ is?

○ A: $x = a$
○ B: $x = -a$
○ C: $y = a$
○ D: $y = -a$

13. The equations $x = a \cos \theta$, $y = b \sin \theta$, $0 \leq \theta < 2\pi$, $a \neq b$, represents?

○ A: A circle
○ B: A parabola
○ C: A hyperbola
○ D: An ellipse

14. The vertex of the parabola $(y - a)^2 = 4a(x - a)$ is?

○ A: (0,a)
○ B: (a,0)
○ C: (0,0)
○ D: None of the above.

15. A second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola if?

○ A: $h^2 - ab = 0$
○ B: $h^2 - ab > 0$
○ C: $h^2 - ab < 0$
○ D: None of the above.

16. What is the length of the major axis for the ellipse $x^2/16 + y^2/4 = 1$?

○ A: 2
○ B: 4
○ C: 6
○ D: 8

17. The equation $y = mx + a/m$ is tangent to $y^2 = 4ax$ for m = ?

○ A: 0
○ B: 1
○ C: All positive values
○ D: All nonzero values

18. What is the center of a circle represented by a general form $5x^2 + 5y^2 + 24x + 36y + 10 = 0$?

○ A: (-12/5 , -18/5)
○ B: (12/5 , 18/5)
○ C: (-9/5 , -7/5)
○ D: (9/5 , 7/5)

19. The interior of a satellite dish has diameter 12 ft and 2 ft deep as shown in the figure below. What is the distance from the center of the dish to the focus?

○ A: 4.5 ft ○ B: 5.5 ft

○ C: 6.0 ft. ○ D: 6.2 ft

TEST 3

1. Minimum number of non-collinear points on a circle required to form an equation of a circle are?

○ A: 2 ○ B: 3

○ C: 4 ○ D: 5

2. The foci of an ellipse are (0, ± 1) and minor axis is of unit length. The equation of the ellipse is ?

○ A: $2x^2 + 4y^2 = 5$ ○ B: $4x^2 + 2y^2 = 5$

○ C: $15x^2 + 6y^2 = 1$ ○ D: $20x^2 + 4y^2 = 5$

3. The sum of distances of any point on the ellipse $3x^2 + 4y^2 = 24$ from its foci is?

○ A: 8 units ○ B: $2\sqrt{2}$ units

○ C: $4\sqrt{2}$ units ○ D: 7 units

4. The line $y + 2x - 5 = 0$ with respect to the circle $x^2 + y^2 + 2x - 9 = 0$?

○ A: Cuts the circle at two distinct points.

○ B: Tangent to the circle. ○ C: Do not touch the circle.

○ D: None of the above.

5. If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then a is equal to?

○ A: 15/16 ○ B: 9/7

○ C: 5/4 ○ D: 2/3

6. What is the equation of tangent to the circle $x^2 + y^2 + 5/3\,x - 13/3\,y + 2/3 = 0$ at (1, 10/3)?

○ A: $21x - 33y + 89 = 0$ ○ B: $33x + 21y + 157 = 0$

○ C: $8x + 46y - 22 = 0$ ○ D: $3x + 19y + 27 = 0$

7. What is the equation of a circle with diameter between two points A (2,3) and B (4,6)?

○ A: $x^2 + y^2 + 3x - 9y - 23 = 0$ ○ B: $x^2 + y^2 - 9x - 2y + 11 = 0$

○ C: $x^2 + y^2 - 6x - 9y + 26 = 0$ ○ D: Cannot be determined from the given information.

8. If e_1 and e_2 are eccentricities of the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$and $x^2/b^2 - y^2/a^2 = 1$ then?

○ A: $e_1 = e_2$ ○ B: $e_1 * e_2 = 1$

○ C: $e_1 + e_2 = 0$ ○ D: $1/e_1^2 + 1/e_2^2 = 1$

9. The line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$ if c equals?

○ A: 2 ○ B: 1/2

○ C: 0 ○ D: -1/2

10. The equation of the circle whose diameter is the latusrectum of the parabola $x^2 = 4y$ is?

○ A: $x^2 + (y-1)^2 = 4$ ○ B: $(x - 2)^2 + (y - 1)^2 = 4$

○ C: $y^2 + (x-1)^2 = 4$ ○ D: $y^2 + (x-1)^2 = 2$

11. Line $y = 2c$ is a tangent to the parabola $y^2 = 4ax$ if c is equal to?

○ A: 0 ○ B: 4

○ C: 2a ○ D: None of the above.

12. The line $5y + 12x - 39 = 0$ to the circle $x^2 + y^2 = 9$?

○ A: Cuts the circle in two distinct points.

○ B: Do not touch the circle ○ C: Is tangent to circle

○ D: Cuts the circle at two imaginary points

13. What is the equation of a circle passing through non collinear points A(5, 8) and B(-2,9)?

○ A: $x^2 + y^2 + 4x - 12y - 20 = 0$ ○ B: $x^2 + y^2 + 4x - 9y - 15 = 0$

○ C: $x^2 + y^2 + 9x - 7y + 3 = 0$ ○ D: Equation cannot be formed from the given information.

14. What is the focus of the ellipse given by the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$?

○ A: $(1, \pm\sqrt{5})$ ○ B: $(1,-1\pm\sqrt{5})$

○ C: $(1,1\pm\sqrt{5})$ ○ D: $(1\pm\sqrt{5}, -1)$

15. $x = \frac{e^t + e^{-t}}{2}$, $y = \frac{e^t - e^{-t}}{2}$; $t \in R$ represents

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

16. The line $y = mx + 1$ is tangent to parabola $y^2 = 4x$ if m = ?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

17. Slope of the normal at point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is?

○ A: 1/t ○ B: t

○ C: -t ○ D: -1/t

18. What is the equation of the asymptotes for the given hyperbola?

$4x^2 - 9y^2 - 32x - 18y + 19 = 0$.

○ A: $(y + 1) = \pm 2/3 (x - 4)$ ○ B: $(y + 1) = \pm 4/9 (x - 4)$

○ C: $(y - 1) = \pm 2/3 (x + 4)$ ○ D: $(y - 1) = \pm 4/9 (x + 4)$

19. The general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a hyperbola if?

○ A: $h^2 - ab < 0$ ○ B: $h^2 - ab = 0$

○ C: $h^2 - ab > 0$ ○ D: None of the above.

20. The point on the curve $y^2 = x$, where the tangent line makes an angle of 45° with the x-axis is?

○ A: (3/4,1/2) ○ B: (1/4,1/2)

○ C: (1/4,3/2) ○ D: (1,2)

TEST 4

1. **Parametric form of equation for a cricle is?**

○ A: $(a \sec \Theta, b \tan \Theta)$
○ B: $(r \cos \Theta, r \sin \Theta)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(at^2 , 2at)$

2. **What is the vertex of the parabola $y = -2x^2 + 4x + 1$?**

○ A: (2,1)
○ B: (-2,-1)
○ C: (-1,-3)
○ D: (1,3)

3. **If one foci of the ellipse is at (-3,0) and the ellipse is centered around the origin. What is the distance between the two foci of the ellipse?**

○ A: Cannot be determined.
○ B: 9
○ C: 6
○ D: 3

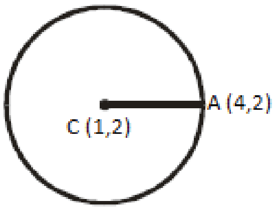
4. **What is the focus of the parabola $y^2 - x - 2y + 2 = 0$?**

○ A: (3/4 , 1)
○ B: (1/4 , 0)
○ C: (1/4 , 1)
○ D: (5/4 , 1)

5. **Axis of the parabola $9y^2 -16x -12y - 57 = 0$ is?**

○ A: 2/3
○ B: 3/2
○ C: -2/3
○ D: -3/2

6. **What is the equation of the circle given in the figure below?**



○ A: $(x - 1)^2 + (y - 2)^2 = 16$
○ B: $(x + 1)^2 + (y + 2)^2 = 9$
○ C: $(x - 1)^2 + (y - 2)^2 = 9$
○ D: $(x - 1)^2 + (y + 2)^2 = 16$

7. **Parametric form of equation for a parabola is?**

○ A: $(r \cos \Theta, r \sin \Theta)$
○ B: $(at^2 , 2at)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(a \sec \Theta, b \tan \Theta)$

8. **The equation of the parabola with focus at (0, a) and directrix $y + a = 0$ is $(a > 0)$?**

○ A: $x^2 = 4ay$
○ B: $x^2 = -4ay$
○ C: $y^2 = 4ax$
○ D: $y^2 = -4ax$

9. **The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is?**

○ A: (4,4)
○ B: (2,2)
○ C: $(\sqrt{2}, 2)$
○ D: $(2\sqrt{2}, 2)$

10. **For a general equation $Ax^2 + By^2 + Gx + Fy + C = 0$, if A is not equal to B and both have opposite signs then it represents?**

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

11. The line $y = mx + c$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ if?

○ A: $c = a/m$
○ B: $c^2 = a^2 m^2 + b^2$
○ C: $c^2 = a^2 m^2 - b^2$
○ D: None of the above.

12. If a is the major axis, b is the minor axis and e is the eccentricity of an ellipse. Its directrices are given by?

○ A: $\pm c/e$
○ B: $\pm b/e$
○ C: $\pm a/e$
○ D: $\pm b/e^2$

13. The equation $(y - y_1)(x_1 + g) = (x - x_1)(y_1 + f)$ represents?

○ A: Tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ B: Normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)
○ C: Chord of a circle $x^2 + y^2 + 2gx + 2fy + c = 0$ through point (x_1 , y_1)
○ D: None of the above.

14. If the length of major axis of ellipse is 2a and length of minor axis is 2b. Then the length if latusrectum is approximately?

○ A: $4b/a$
○ B: $4a^2/b$
○ C: $2b^2/a$
○ D: $a/2b$

15. When the cutting of a conic section is perpendicular to the axis of the cone, it represents a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

16. What is the length of the tangent from point (-5, 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$?

○ A: $\sqrt{29}$
○ B: $\sqrt{67}$
○ C: $\sqrt{102}$
○ D: $\sqrt{133}$

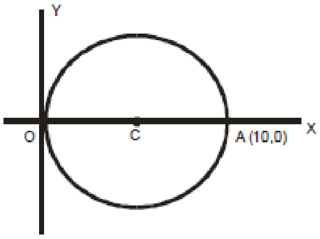
17. From a point P outside a circle, how many tangents can be drawn?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

18. What is the radius of a circle represented by the equation $x^2 + y^2+12x - 10y = 0$?

○ A: $\sqrt{61}$
○ B: $\sqrt{55}$
○ C: $\sqrt{52}$
○ D: $\sqrt{47}$

19. Equation of the circle given in the figure below is?



○ A: $x^2 + y^2 = 25$
○ B: $(x-5)^2 + y^2 = 25$
○ C: $(x + 5)^2 + y^2 = 25$
○ D: $(x + 5)^2 + y^2 = 10$

20. Find the equation of an ellipse with centre (0,0), focus (0,-3) and one vertes at (0,4)?

○ A: $x^2/16 + y^2/7 = 1$
○ B: $x^2/7 + y^2/16 = 1$
○ C: $x^2/\sqrt{7} + y^2/4 = 1$
○ D: $x^2/7 + y^2/4 = 1$

Vectors

TEST 1

1. **What are the direction cosines of unit vector**

$$\hat{\underline{v}} = \left[\frac{6}{\sqrt{41}}, \frac{-2}{\sqrt{41}}, \frac{1}{\sqrt{41}}\right]$$

○ A: 0, 0, 0
○ B: -6/√41 , +2/√41, -1/√41
○ C: 6/√41 , -2/√41, 1/√41
○ D: None of the above.

2. **If volume of a parallelepiped with a ,b , c as co-terminus edges is 36 the volume of the tetrahedron with the same edges is?**

○ A: 13
○ B: 12
○ C: 6
○ D: 3

3. **Value of [i, i , k] is?**

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

4. **The value of 2*i* x 4*k* =?**

○ A: 0
○ B: 8k
○ C: -8j
○ D: 8j

5. **The volume of the parallelepiped with *u* , *v* and *w* as its coterminus edges is?**

○ A: u.(v x w)
○ B: 1/2 * u.(v x w)
○ C: 1/6 * u.(v x w)
○ D: u x (v x w)

6. **If ā is a unit vector. Then the value of ā.ƃ is? Assume that the two vectos are not perpendicular to each other.**

○ A: 0
○ B: 1
○ C: ā cos θ
○ D: ƃ cos θ

7. **Which of the following statement is true?**

○ A: Only dot product possesses distributive property
○ B: Only cross product possesses distributive property
○ C: Both dot and cross product possess distributive property
○ D: Neither dot nor cross product possess distributive property

8. **The value of (2*j x i*) - 3*k* = ?**

○ A: -5k
○ B: 5k
○ C: k
○ D: -k

9. **Find the magnitude of vector v = -3i + 4j ?**

○ A: 2
○ B: 3
○ C: 4
○ D: 5

10. **If terminal point of a vector coincides with its origin point then it is called?**

○ A: Unit Vector.
○ B: Null Vector.
○ C: Equity Vector.
○ D: Negative Vector.

11. If ā = [1,-3] and ƃ = [2,5] ; 4ā + 2ƃ = ?

○ A: [3,2] ○ B: [8,2]
○ C: [-8,2] ○ D: [8,-2]

12. If ā, ƃ and c are three vectors representing three edges of a parallelepiped. Its volume is given by?

○ A: ā x ƃ x c ○ B: ā . ƃ . c
○ C: ā . (ƃ x c) / 2 ○ D: ā . (ƃ x c)

13. If three vectors are coplanar then their scalar triple product is?

○ A: 0 ○ B: 1
○ C: -1 ○ D: Equal to vector triple product.

14. i.j = ?

○ A: 0 ○ B: 1
○ C: -1 ○ D: k

15. If ā = i - k and ƃ = j + k then the projection of ā along ƃ is?

○ A: -1/√2 ○ B: 1/√2
○ C: 1 ○ D: -1

16. If k is a scalar ā x kƃ = ?

○ A: kā x ƃ ○ B: k (ā x ƃ)
○ C: kā x kƃ ○ D: Both A and B.

17. If ā = [2,1,3] and ƃ = [-1,4,0]. What is the magnitude of ā - 2ƃ?

○ A: 16 ○ B: √74
○ C: √93 ○ D: 36

18. What is the unit vector for v = 3i - j +2k?

○ A: [3/√14 , 1/√14, 2/√14] ○ B: [5/√37 , -2/√37, 7/√37]
○ C: [1/√37 , 8/√37, -3/√37] ○ D: [3/√14 , -1/√14, 2/√14]

19. The position vector of a point P(x, y, z) is denoted by?

○ A: $\overrightarrow{PQ}$ ○ B: $\overrightarrow{P}$
○ C: $\overrightarrow{OP}$ ○ D: All of the above.

20. k.k =?

○ A: 0 ○ B: 1
○ C: -1 ○ D: j

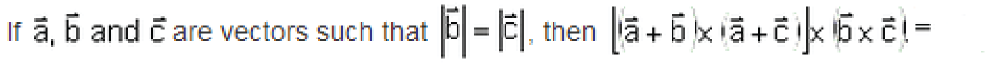
TEST 2

1. If AB = i + j + k, AC = -4k and AD = i +2j - 8k then the volume of tetrahedron ABCD formed by the three vectors is?

○ A: 1
○ B: 2/3
○ C: 2
○ D: 4

2. What is the value of α such that αi + j , i + j + 3k and 2i + j - 2k are coplanar?

○ A: 1/3
○ B: 7/4
○ C: 9/5
○ D: 8/5

3. 

If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors such that $|\vec{b}| = |\vec{c}|$, then $\left[(\vec{a} + \vec{b}) \times (\vec{a} + \vec{c})\right] \times (\vec{b} \times \vec{c}) =$

○ A: 1
○ B: -1
○ C: 0
○ D: 2

4. (2j x 3i).k = ?

○ A: 0
○ B: 7
○ C: 6
○ D: -6

5. What is the vector perpendicular to both vectors ā = 2i - j + k and ƃ = 4i + 2j - k?

○ A: -i + 6j + 8k
○ B: -2i + 3j + 9k
○ C: 3i + 1j + 7k
○ D: 5i - 3j + k

6. If ā = 2i - 4j + 5k and ƃ = 4i + xj - 4k. What is the value of x if ā and ƃ are perpendicular to each other?

○ A: -1
○ B: -2
○ C: -3
○ D: -4

7. Which of these vectors are parallel?

a = 2i + 3j + k, b = 4i + 6j + 2k, c = 6i + 9j + 3k

○ A: a and b
○ B: a and c
○ C: a, b and c all are parallel to each other.
○ D: None of them is parallel.

8. Unit vector perpendicular to i - j and i + j is?

○ A: k
○ B: -k
○ C: (i - j) / 2
○ D: (i + j) / √2

9. Which of the following expressions is meaningful?

○ A: u.(v x w)
○ B: (u.v) .w
○ C: (u.v) . w
○ D: None of the above.

10. Zero vector is?

○ A: Parallel to every vector.
○ B: Perpendicular to every vector.
○ C: Both parallel and perpendicular to every vector.
○ D: Is inverse of every vector.

TEST 3

1. **The point which divides the line joining (2, 4, 5) and (-3, 5, - 4) in the ratio 2 : 3, lies on?**

○ A: XY plane ○ B: YZ plane

○ C: XZ plane ○ D: None of the above.

2. **If result of two forces ā of magnitude (P) and б of magnitude (Q) isperpendicular to ā and has magnitude P. Then the magnitude of б is?**

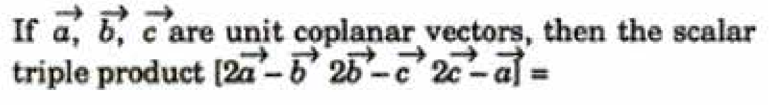
○ A: P ○ B: P√2

○ C: P√3 ○ D: 2P√3

3. **If ā x б = ā x ē then which of the following is true?**

○ A: ā, б and ē are coplanar. ○ B: ā, б and ē are orthogonal

○ C: б = ē ○ D: ā is parallel to б

4. 

If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}\ \ 2\vec{b}-\vec{c}\ \ 2\vec{c}-\vec{a}] =$

○ A: 0 ○ B: 1

○ C: √2 ○ D: √3

5. **If ā, б, ē, ō are the vertices of a square then?**

○ A: б - ā = ē – б ○ B: ā + б + ē = 0

○ C: (ē - ā) . (ō - б) = 0 ○ D: None of the above.

6. **If the vectors a, b and c be the vectors representing the sides AB, BC and CA respectively of a triangle ABC, then?**

○ A: a.(bxc) = 0 ○ B: (a.b) x c = (a.c) x b

○ C: |a x b| = |a x c| = |b x c| ○ D: |a x b| + |b x c| + |c x a| = 0

Position vector a = 2i - 3j and b = 3i + 2j. What are the coordinates of position vector that divides the line between a and b in ration 4:3?

○ A: 11/7 i + 8/7 j ○ B: 1/7 i - 5/7 j

○ C: 18/7 i - 1/7 j ○ D: 23/7 i + 3/7 j

7. **The points (5, 2, 4), (6, −1, 2) and (8, −7, k) are collinear if k is equal to?**

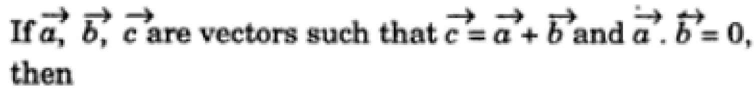
○ A: 3 ○ B: 2

○ C: -1 ○ D: -2

8. **If A (-2,-3), B (1,4), C(0,-5) are three vertices of parallelogram ABCD. What are the coordinates of D if AB is parallel to DC?**

○ A: (3,14) ○ B: (-4,11)

○ C: (-3, -12) ○ D: (-4, 9)

9. 

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{c}=\vec{a}+\vec{b}$ and $\vec{a}\cdot\vec{b}=0$, then

○ A: $a^2 + b^2 + c^2 = 0$ ○ B: $a^2 - b^2 = c^2$

○ C: $a^2 + b^2 = 0$ ○ D: $c^2 = a^2 + b^2$

10. **The point having position vectors $2\hat{i}+3\hat{j}+4\hat{k}$, $3\hat{i}+4\hat{j}+2\hat{k}$, $4\hat{i}+2\hat{j}+3\hat{k}$ are the vertices of a triangle. The triangle is?**

○ A: Right angled.
○ B: Equilateral.
○ C: Isosceles.
○ D: None of the above.

11. **The points with position vectors $14\hat{i}-13\hat{j}$, $12\hat{i}-5\hat{j}$ and $a\,\hat{i}+11\,\hat{j}$ are collinear if a equals**

○ A: 8
○ B: 13
○ C: -5
○ D: -9

12. **Angles α , β and δ are direction angles of a single vector only if?**

○ A: $\cos^2\alpha=\cos^2\beta=\cos^2\delta$
○ B: $\cos^2\alpha=\cos^2\beta+\cos^2\delta$
○ C: $\cos^2\alpha+\cos^2\beta+\cos^2\delta=0$
○ D: $\cos^2\alpha+\cos^2\beta+\cos^2\delta=1$

13. **Let $\vec{a}=\hat{i}-\hat{k}$, $\vec{b}=x\hat{i}+\hat{j}+(1-x)\hat{k}$ and $\vec{c}=y\hat{i}+x\hat{j}+(1+x-y)\hat{k}$, then $[\vec{a}\ \vec{b}\ \vec{c}]$ depends on**

○ A: Only x
○ B: Only y
○ C: Both x and y
○ D: Neither x nor y

TEST 4

1. **Unit vector in the direction of vector v = [-3,-4] is?**

○ A: -3/5 i - 4/5 j
○ B: -3/5 i + 4/5 j
○ C: 3/5 i - 4/5 j
○ D: 3/5 i + 4/5 j

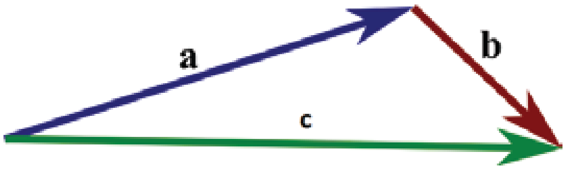
2. **Let a = 2i + j + k, a vector c perpendicular to a is?**

○ A: $\frac{1}{\sqrt{2}}(-j+k)$
○ B: $\frac{1}{\sqrt{3}}(i+j-k)$
○ C: $\frac{1}{\sqrt{5}}(-i-j-k)$
○ D: $\frac{1}{\sqrt{2}}(i-2j)$

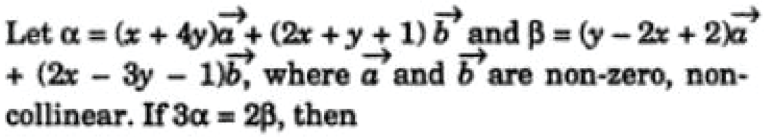
3. **The area (in square units) of the parallelogram whose diagonals are $\vec{a}=\hat{i}+\hat{j}-2\hat{k}$ and $\vec{b}=\hat{i}-3\hat{j}+4\hat{k}$**

○ A: √7
○ B: √11
○ C: √14
○ D: Cannot be determined from the given information.

4. **In the figure below vector b is given by?**



○ A: c + a
○ B: c - a
○ C: a – c
○ D: None of the above.

5. 

Let $\alpha = (x + 4y)\vec{a} + (2x + y + 1)\vec{b}$ and $\beta = (y - 2x + 2)\vec{a} + (2x - 3y - 1)\vec{b}$, where $\vec{a}$ and $\vec{b}$ are non-zero, non-collinear. If $3\alpha = 2\beta$, then

○ A: x= 1, y = -2 ○ B: x= -2, y = -1
○ C: x= 2, y = 2 ○ D: x= 2, y = -1

6. **For two position vectors ā and б. The coordinates of position vector dividing the line between ā and б in ration 1 : 1 would be?**

○ A: (ā - б) / 2 ○ B: (ā + б) / 2
○ C: (ā + б) / 4 ○ D: (ā - б) / 4

7. **If magnitude of vector ā = 25 the ā.ā = ?**

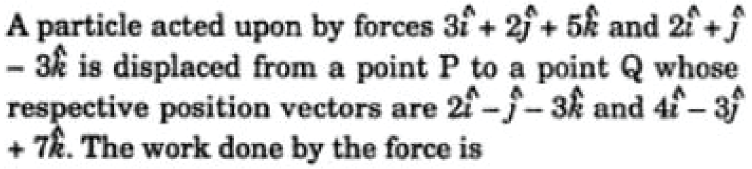
○ A: 5 ○ B: 25
○ C: 625 ○ D: 0

8. **Which of the following is not a defined quantity?**

○ A: i.i / k.k ○ B: i.j / j.j
○ C: i.i / i.k ○ D: All of them are defined quantities.

9. **If ā.i = 0 and ā.j = 0 and ā.k = 0 then value of ā is?**

○ A: i + j + k ○ B: [-1,-1,-1]
○ C: Unit vector. ○ D: Null vector.

10. 

A particle acted upon by forces $3\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}$ is displaced from a point P to a point Q whose respective position vectors are $2\hat{i} - \hat{j} - 3\hat{k}$ and $4\hat{i} - 3\hat{j} + 7\hat{k}$. The work done by the force is

○ A: 16 ○ B: 24
○ C: 36 ○ D: 38

11. **Value of [k, i, j] is?**

○ A: 0 ○ B: 1
○ C: -1 ○ D: √-1

12. **Area of a parallelogram which has vectors i and i + j as the adjecent sides is?**

○ A: ½ ○ B: 1
○ C: 2 ○ D: √2

13. **If ā x б = i + 2j + 2k then б x ā= ?**

○ A: 1/3i + 2/3j + 2/3k ○ B: -i - 2j - 2k
○ C: 2i + 2j + k ○ D: None of the above.

14. **If ā = б then the value of triple scalar product ā.(б x c) is?**

○ A: 0 ○ B: 1
○ C: -1 ○ D: ā.б

15. Which of the following quantities is undefined?

○ A: (i.i) / (i x j)
○ B: (i.j) / (j.j)
○ C: (j x k) / (i x j)
○ D: (i x k) / (j x j)

16. Which of the following statement is true?

If a.b = 0 a and b are parallel, If a x b = 0 then either a or b must be zero,

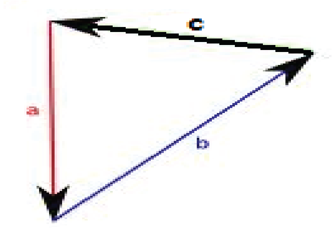
If a. (b x c) = 0 then a, b and c are coplanar.

○ A: iii only
○ B: i and ii only
○ C: ii and iii only
○ D: i, ii and iii

17. If *u* = 2*i*ˆ - 4 ˆ*j* + 5*k*ˆ and *v* = 4*i*ˆ - 3 ˆ*j* - 4*k*ˆ then *u* and *v* are?

○ A: Parallel
○ B: Perpendicular
○ C: Equal
○ D: Opposite

18. Which of the following is true about the vector diagram given below?



○ A: c = a + b
○ B: c = a - b
○ C: a + b = 0
○ D: a + b + c = 0

19. Which of the following position vectors have same magnitude?

a= [3,-4,2], b = [-3, 4, -2], c = [2, 4, 3]

○ A: a and b
○ B: a and c
○ C: All have same magnitude.
○ D: None of the has same magnitude.

20. In a parallelogram, the cross product of two adjacent vectors AB = i + 2j - 2j and BC = -2i + 2j + k is : 6i + 3j + 6k. The area of the parallelogram is?

○ A: 4.5
○ B: 9
○ C: 15
○ D: 18

I N D E X

Number System

Test 1 09
Test 2 11
Test 3 13
Test 4 15

Sets & Functions

Test 1 17
Test 2 20
Test 3 22
Test 4 24

Matrices & Determination

Test 1 26
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Quadratic Equations

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Test 1 44
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Test 1 62
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Test 3 118
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Vectors

Test 1 122
Test 2 124
Test 3 125
Test 4 126

Number Systems

TEST 1

1. **i^{13} = ?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

2. **If -1 + √-3 = r $e^{i\Theta}$ then Θ equals to?**

○ A: 2 pi / 3
○ B: -2 pi / 3
○ C: pi / 3
○ D: - pi / 3

3. **Square roots of -1 are?**

○ A: i , -I
○ B: i
○ C: 1
○ D: -i

4. $\left(\frac{2i}{1+i}\right)^2$ **is equal to?**

○ A: I
○ B: 2i
○ C: 1-I
○ D: 1-2i

5. **Conjugate of 4 + 5i is?**

○ A: -4 + 5i
○ B: 4 - 5i
○ C: $4^2 + (5i)^2$
○ D: 5 + 4i

6. **$(1 + i)^2$ = ?**

○ A: 2i
○ B: -2i
○ C: I
○ D: -i

7. **The value of** $\frac{i^{4n+1} - i^{4n-1}}{2}$ **is equal to?**

○ A: 1
○ B: -1
○ C: I
○ D: -i

8. **If y and g are two complex numbers then** $\overline{y+g} = ?$

○ A: $\bar{y} . \bar{g}$
○ B: $\bar{y} / \bar{g}$
○ C: $\bar{y} + \bar{g}$
○ D: $\bar{y} - \bar{g}$

9. **(3 + 2i) + (1 + i) = ?**

○ A: 4 + 2i
○ B: 4 + 3i
○ C: 4 - 2i
○ D: 4 - 3i

10. **The complex number i + √3 in polar form can be written as?**

○ A: $\frac{1}{\sqrt{2}}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ B: $2\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$
○ C: $\frac{1}{2}(sin\ \ \pi/6 + i\ cos\ \pi/6)$
○ D: $4\,(cos\ \ \pi/6 + i\ sin\ \pi/6)$

11. **If $g = 2 + i\sqrt{3}$ then $g.\bar{g}$ = ?**

○ A: $2 - i\sqrt{3}$ ○ B: 13

○ C: 8 ○ D: 7

12. **The moduli of complex number $1 - i\sqrt{3}$ = ?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

13. **4 * (1 - 3i) = ?**

○ A: 4 - 3i ○ B: 40

○ C: 4 - 12i ○ D: None of the above.

14. **Multiplicative identity for complex numbers is?**

○ A: (0 , 0) ○ B: (0 , 1)

○ C: (1 ,1) ○ D: (1 , 0)

15. **If z is a complex number then | z1 . z2 | = ?**

○ A: $\sqrt{(z1)^2 + (z2)^2}$ ○ B: $\sqrt{(z1)^2 - (z2)^2}$

○ C: | z1 | x | z2 | ○ D: | z1 | / | z2 |

16. **(5, 0) * (2 , 0) = ?**

○ A: 10 ○ B: 10 + i

○ C: 10 + 2i ○ D: 10 + 5i

17. **If z = 1 + i then multiplicative inverse of z^2 is?**

○ A: 1 – I ○ B: i / 2

○ C: - i / 2 ○ D: 2i

18. **What is the product of (1 + i) and (1 + 2i)?**

○ A: -2 + I ○ B: 2 + i

○ C: -1 + 3i ○ D: 1 + 3i

19. **The value of | -5i | is?**

○ A: 5 ○ B: 10

○ C: 20 ○ D: 25

20. $\left(\dfrac{1-i}{1+i}\right)^{20}$ **is equal to?**

○ A: 1 ○ B: 1/2

○ C: -1/2 ○ D: -1

TEST 2

1. The complex number (1 + 2i) / (1 - i) lies in?

○ A: I quadrant
○ B: II quadrant
○ C: III quadrant
○ D: IV quadrant.

2. A complex number added to its additive inverse would give?

○ A: Multiplicative identity
○ B: Additive identity
○ C: Additive inverse.
○ D: Multiplicative inverse.

3. If y is a complex number then | -y | = ?

○ A: | y |
○ B: | ȳ |
○ C: | -ȳ |
○ D: All of the above.

4. If z is a complex number such that z + 1/z = 1 then the value of z^{99} + 1/z^{99} is ?

○ A: 1
○ B: -1
○ C: 2
○ D: -2

5. Express in terms of *i* the sum of $\sqrt{-81}$ and $2\sqrt{-25}$.

○ A: 9i
○ B: -9i
○ C: 23i
○ D: 19i

6. Even integers (including zero) are closed under which of the following operation?

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: All of the above.

7. $\left[i^{67} + \frac{1}{i^{125}}\right] = ?$

○ A: 0
○ B: 2
○ C: 2i
○ D: -2i

8. If F = $x^3 + x^2 + 2x + 6$ then F(i) = ?

○ A: 3 + I
○ B: 5 + i
○ C: 3 – I
○ D: 2 - 5i

9. Find multiplicative inverse of √2 - i√5 ?

○ A: -(√2 / 7) + (√5 / 7)I
○ B: (√2 / 7) - (√5 / 7)i
○ C: (√2 / 7) + (√5 / 7)I
○ D: -(√2 / 7) - (√5 / 7)i

10. Square roots of number $(-3)^2$ are?

○ A: 3i , -3i
○ B: 3
○ C: -3i
○ D: 3, -3

11. If y is a complex number then y . ȳ = ?

○ A: ȳ

○ B: y

○ C: $|-y|^2$

○ D: None of the above.

12. The modulus of the complex number $\frac{(1 - i\sqrt{3})(\cos\theta + i\sin\theta)}{2(1 - i)(\cos\theta - i\sin\theta)}$ is

○ A: 1/√2

○ B: 1/2√2

○ C: 1/√3

○ D: None of these.

13. $(\cos \Theta + i \sin \Theta)^n = ?$

○ A: $(\cos \Theta^n + i \sin \Theta^n)$

○ B: cos nΘ - i sin nΘ

○ C: cos nΘ + i sin nΘ

○ D: ncos Θ + i n sin Θ

14. $i^5 + i^6 = ?$

○ A: 1 + I

○ B: -1 + i

○ C: i

○ D: 2I

15. $(-1)^{-21/2} = ?$

○ A: 0

○ B: 1

○ C: I

○ D: -i

16. Multiplicative inverse of the complex number 1 + i is?

○ A: 1 – I

○ B: 1/2 + 1/2i

○ C: 1/2 - 1/2i

○ D: 1/√2 - i 1/√2

17. $\frac{2+i}{2-i} - \frac{2-i}{2+i} = ?$

○ A: i / 5

○ B: i / 3

○ C: 8i / 5

○ D: 7i / 5

18. The conjugate complex of number $(2 - i) / (1 - 2i)^2$ is equal to?

○ A: 2 / 25 + i 11 / 25

○ B: 2 / 25 - i 11 / 25

○ C: - 2 / 25 + i 11 / 25

○ D: - 2 / 25 - i 11 / 25

19. If $8iz^3 + 12z^2 - 18z + 27i = 0$, then?

○ A: |z| = 3/2

○ B: |z| = 2/3

○ C: |z| = 1

○ D: |z| = 1/3

20. (8 , 9) * (5, -6) =?

○ A: (14, -1)

○ B: (94, -3)

○ C: (48, -2)

○ D: None of the above.

TEST 3

1. **The triangle formed by points 1 , (1 + i) / √2 and i in the argand diagram is?**

   ○ A: Scalene
   ○ B: Equilateral
   ○ C: Isoceles
   ○ D: Right angled

2. **The smallest integer n for which** $\left(\frac{1+i}{1-i}\right)^n = 1$ **is?**

   ○ A: 4
   ○ B: 8
   ○ C: 12
   ○ D: 16

3. **$i^{88} - i^{22} = ?$**

   ○ A: I
   ○ B: -i
   ○ C: 1
   ○ D: 2

4. **If $a = |z_1| - |z_2|$; $b = |z_1 + z_2|$ and $c = |z_1| + |z_2|$ then which of the following is true?**

   ○ A: $c \leq b \leq a$
   ○ B: $a \leq c \leq b$
   ○ C: $b \leq a \leq c$
   ○ D: None of the above.

5. **if $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$, then b is equal to ?**

   ○ A: √3
   ○ B: √2
   ○ C: 1
   ○ D: None of the above.

6. **Number of solutions for the equation** $z^2 + \bar{z} = 0$ **is?**

   ○ A: One
   ○ B: Two
   ○ C: Three
   ○ D: Four

7. If *s* and *t* are different integers and $\sqrt{st} = 8$, which of the following could *not* be a value of *s* + *t*?

   ○ A: 16
   ○ B: 20
   ○ C: 34
   ○ D: 65

8. **The modulus of** $\sqrt{2i} - \sqrt{-2i}$ **is?**

   ○ A: 2
   ○ B: √2
   ○ C: 0
   ○ D: 2√2

9. If x = $\sqrt{-1 - \sqrt{-1 - \sqrt{-1 - \sqrt{-1}}}}$ ... then x is equal to

   ○ A: w
   ○ B: w^2
   ○ C: w or w^2
   ○ D: 0

10. **The number of solutions for the equation $z^2 + |z|^2 = 0$ are? (z is a complex number)**

   ○ A: One
   ○ B: Two
   ○ C: Three
   ○ D: Infinite

11. The smallest positive number n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is?

○ A: 12
○ B: 8
○ C: 4
○ D: 2

12. For positive integers $(1 - i)^n \left(1 - \frac{1}{i}\right)^n$ **equals to?**

○ A: 0
○ B: $2i^n$
○ C: 2^n
○ D: 4^n

13. The complex numbers sin x + i cos 2x and cos x - i sin 2x are conjugate to each other for ?

○ A: x = n * pi
○ B: x = (n + 1/2) * pi
○ C: x = 0
○ D: No value of x.

14. Which of the following numbers lie on the imaginary axis of the Argand diagram?

○ A: 8 + 3i
○ B: 0 + 3i
○ C: 8 + 0i
○ D: None of the above.

15. Cube roots of unity?

○ A: Are collinear
○ B: Lie on the circle of radius √3
○ C: Form an equilateral triangle.
○ D: None of the above.

16. Which of the following is true about complex numbers?

○ A: They do not have a multiplicative inverse.
○ B: They don't have an additive inverse.
○ C: They always lie on the imaginary axis of the Argand diagram.
○ D: They don't satisfy the order of axioms.

17. Sum of three consecutive odd numbers is always divisible by?

○ A: 2
○ B: 3
○ C: 4
○ D: 6

18. $(a - ib)^3$ = ?

○ A: $a^3 - i(3a^2b - b^3)$
○ B: $a^3 - 3ab^2 - i(3a^3 - b^3)$
○ C: $a^3 + 3ab^2 - i(3a^2b - b^3)$
○ D: $a^3 - 3ab^2 - i(3a^2b - b^3)$

19. If $p^2 - 2pq + q^2 = c$ where p and q are positive integers and p is even and q is odd which of the following is true?

○ A: c is even and a perfect square.
○ B: c is odd and a perfect square.
○ C: c is even and not a perfect square.
○ D: c is odd and not a perfect square.

20. If $\left[\dfrac{(\sqrt{3}/2) + i\,(1/2)}{(\sqrt{3}/2) - i\,(1/2)}\right]^{120} = a + i\,b$, then

○ A: a = cos 20° and b = - sin 20°
○ B: a = cos 20° and b = sin 20°
○ C: a = 0 and b = 1
○ D: a = 1 and b = 0

TEST 4

1. $\left|(1+i)\left(\frac{2+i}{3+i}\right)\right|$ **is equal to?**

○ A: -1/2
○ B: 1/2
○ C: 1
○ D: -1

2. The value of (– i)$^{1/3}$ is ?

○ A: -I
○ B: i
○ C: 1
○ D: None of the above.

3. Which of the following is an irrational number?

○ A: $\sqrt[3]{-8}$
○ B: $\sqrt{\frac{32}{50}}$
○ C: 5 / √5
○ D: All of the above.

4. If (x + iy)(p + iq) = (x^2 + y^2)i then?

○ A: p = x, q = y
○ B: p = x^2, q = y^2
○ C: q = x, p = y
○ D: None of the above.

5. If ⊙ is an operation on positive real numbers, for which of the following definitions of ⊙ is $r \odot s = s \odot r$ (commutative property)?

○ A: r ʘ s = r – s
○ B: r ʘ s = r / s
○ C: r ʘ s = r^{2}s
○ D: r ʘ s = (r + s) / (rs)

6. The complex number 1 + i√3 in polar form is equal to?

○ A: 2 cos 60° - i 2 sin 60°
○ B: 4 cos 60° + i 4 sin 60°
○ C: 4 cos 60° - i 4 sin 60°
○ D: 2 cos 60° + i 2 sin 60°

7. (2 , 6) / (3 , 7) = ?

○ A: (6/29 , -1/29)
○ B: (2/29 , -2/29)
○ C: (24/29 , 2/29)
○ D: (18/29 , 2/29)

8. $\frac{(1+i)^n}{(1-i)^{n-2}}$ **is equal to?**

○ A: 4i^{n-2}
○ B: 2i^{n-4}
○ C: 2i^{n-1}
○ D: None of the above.

9. **If $z = \frac{\sqrt{3}+i}{2}$, then $(z^{101} + i^{103})^{105}$ is equal to**

○ A: I
○ B: -1
○ C: 0
○ D: 1

10. Reciprocal of i is?

○ A: -1
○ B: 1
○ C: I
○ D: -i

11. $\frac{(1+i)^{2n+1}}{(1-i)^{2n-1}}$ **is equal to?**

○ A: 2 $(-1)^n$
○ B: 2i
○ C: -2
○ D: 2 + 2i

12. If Ȳ = y then y is?

○ A: Complex number
○ B: Real number
○ C: Ȳ is complex conjugate of y
○ D: None of the above.

13. The equation $|z - 1|^2 + |z + 1|^2 = 2$ **represents?**

○ A: A circle of radius 1
○ B: A circle of radius 2
○ C: Ordered pair (0, 0)
○ D: A straight line.

14. The number 4 + 3i lies on the ?

○ A: Imaginary axis of the Argand diagram.
○ B: Real axis of the Argand diagram.
○ C: Neither real nor imaginary axis of the Argand diagram.
○ D: None of the above.

15. Absolute value of complex number z = a + ib = ?

○ A: a + b
○ B: $a^2 + b^2$
○ C: $\sqrt{z.\tilde{z}}$
○ D: $z.\tilde{z}$

16. If $z = \left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^5$, then

○ A: Re (z) > 0
○ B: Re (z) > 0 and Im (z) > 0
○ C: Re (z) > 0 and Im (z) < 0
○ D: Im (z) = 0

17. $\sqrt{\frac{1}{-4}}$ **is equal to?**

○ A: i / 2
○ B: - i / 2
○ C: 2 I
○ D: -2 i

18. If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$ **then** α^{31} **is equal to?**

○ A: α
○ B: α^2
○ C: 0
○ D: 1

19. (a + bi) * (c + di) = ?

○ A: (ac - bd) + (ad + bc) I
○ B: (ac + bd) + (ad + bc) i
○ C: (ac - bd) + (ad - bc) I
○ D: (ac + bd) + (ad - bc) i

Sets & Functions

TEST 1

1. **If $A \cap B = \Phi$ then A and B are called?**

○ A: Complement of each other.
○ B: Null sets
○ C: Disjoint sets
○ D: Universal sets.

2. **Residue class modulo 5 for $4 + 3$ is?**

○ A: 2
○ B: 3
○ C: 5
○ D: 7

3. **$(A \cup B)' = ?$**

○ A: $A' \cup B'$
○ B: $A' \cap B'$
○ C: $A - B$
○ D: $(A - B)'$

4. **If $A = \{1,2,3\}$ and $B = \{2,3\}$, then $A \cup B =?$**

○ A: $\{1\}$
○ B: $\{2,3\}$
○ C: $\{1,2\}$
○ D: $\{1,2,3\}$

5. **A set of all possible sub sets of a set is known as?**

○ A: Power set
○ B: Proper subset
○ C: Singleton Set
○ D: Universal set.

6. **$A \cap B = \Phi$ then $(A \cup B) = ?$**

○ A: $(A \cup B) = A + B$
○ B: $(A \cup B) = A + B - (A \cap B)$
○ C: $(A \cup B) = (A \cap B)$
○ D: Undefined.

7. **Set of all integers is not closed with respect to?**

○ A: Addition
○ B: Subtraction
○ C: Multiplication
○ D: Division

8. **Which of the following is a singleton set?**

○ A: $\{\ \}$
○ B: $\{0\}$
○ C: $\{5\}$
○ D: Both B and C.

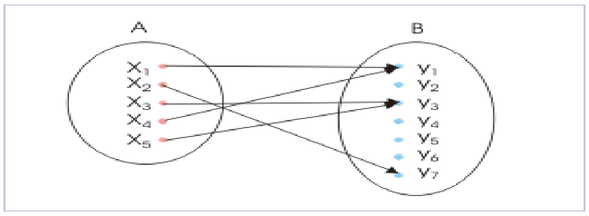
9. **Drawing conclusion from limited number of observations is called?**

○ A: Induction
○ B: Deduction
○ C: Logic
○ D: Proposition

10. **$Z = \{x \mid x = p/q$ where $p,q \in Z$ and $q \neq 0\}$ is a set of?**

○ A: Natural numbers
○ B: All integers
○ C: Irrational numbers
○ D: Rational numbers.

11. The figure below shows what kind of function?



○ A: Into function ○ B: (1-1) and into function

○ C: Onto function ○ D: (1-1) and onto function

12. Which of the following relations is true?

○ A: 0 ∈ { } ○ B: 0 ∈ {Φ}

○ C: 0 ∈ {0} ○ D: None of the above.

13. Which of the following is defined with respect to the universal set?

○ A: Difference of two sets. ○ B: Intersetction of sets

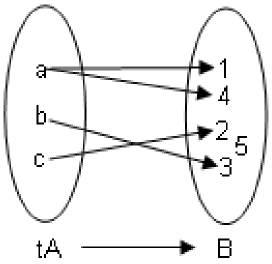
○ C: Union of sets ○ D: Complement of sets

14. Aristotelian logic has how many possible outcomes?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

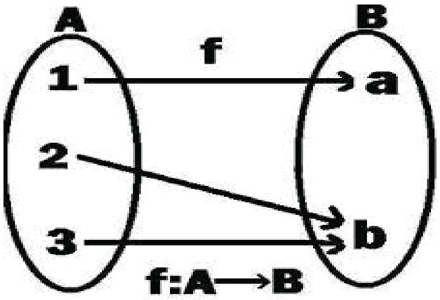
15. The diagram below shows that?



○ A: f is function from A to B ○ B: f is a one-one function from A to B

○ C: f is an onto function from A to B ○ D: f is not a function

16. The figure below shows what kind of function?



○ A: Into function ○ B: (1-1) and into function

○ C: Onto function ○ D: (1-1) and onto function.

17. The domain of the function f = {(1, 3), (3, 5), (2, 6)} is?

○ A: 1, 3 and 2 ○ B: {1,3,2}

○ C: 3, 5 and 6 ○ D: {3,5,6}

18. Residue class modulo 7 for 9 + 5 is?

○ A: 14 ○ B: 7

○ C: 3 ○ D: 0

19. There are how many ways of describing a set?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

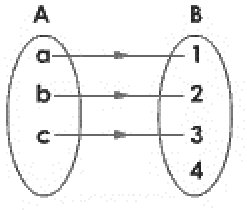
20. If A is a subset of B then A U B =?

○ A: A ○ B: B

○ C: A – B ○ D: B - A

TEST 2

1. **The figure below shows what kind of function?**



○ A: Into Function ○ B: (1-1) and into function
○ C: Onto function ○ D: (1-1) and onto function.

2. **If $(x + 3, y - 2) = (7,5)$ then $(7x, 9y) = ?$**

○ A: (3,-2) ○ B: (28,63)
○ C: (35,42) ○ D: (49,54)

3. **If f = {(1, 4), (2, 5), (3, 6)} and g = {(4, 8), (5, 7), (6, 9)}, then (gof) is?**

○ A: { } ○ B: {(1, 8), (2, 7), (3, 9)}
○ C: {(1, 7), (2, 8), (3, 9)} ○ D: None of the above.

4. **Logical form of $(A \cup B)' = A' \cap B'$ is?**

○ A: $\sim(p \vee q) = \sim p \wedge \sim q$ ○ B: $\sim(p \wedge q) = \sim p \vee \sim q$
○ C: $(p \vee q) = p \wedge q$ ○ D: $(p \vee q) \rightarrow \sim p \wedge \sim q$

5. **If A and B are overlapping sets then A - B =?**

○ A: A ○ B: B
○ C: $A - (A \cap B)$ ○ D: $B - (A \cap B)$

6. **To be classified as a group, the set must satisfy how many properties?**

○ A: 1 ○ B: 2
○ C: 3 ○ D: 4

7. **Set of rational + irrational numbers is a set of?**

○ A: All integers ○ B: All real numbers
○ C: Whole numbers ○ D: All of the above.

8. **Let A = {1, 2, 3}. Then, the domain of the relation R = {(1, 1), (2, 3), (2, 1)} defined on A is?**

○ A: {1,2} ○ B: {1,3}
○ C: {1,2,3} ○ D: None of the above.

9. **All students who appear in GIKI entry test are pass, fail or put in the waiting list. If I appear in the GIKI entry test, I may pass, fail or be in the waiting list. This is an example of (choose the most appropriate answer)?**

○ A: Induction ○ B: Deduction
○ C: Aristotelian logic ○ D: Non Aristotelian logic

10. A - B = Φ and A is not an empty then?

○ A: B = Φ
○ B: B - A = Φ
○ C: A is subset of B
○ D: B is subset of A.

11. If a set has 5 elements. Then number of elements in the power set would be?

○ A: 4
○ B: 8
○ C: 16
○ D: 32

12. Let A and B have 3 and 6 elements, respectively. What can be the minimum number of elements in A U B?

○ A: 3
○ B: 6
○ C: 9
○ D: Cannot determine.

13. If f : A → B be defined by f(x) = x + i, where i is a fixed integer and x set of integers, then f is?

○ A: Onto function
○ B: Into function
○ C: (1-1) and into function.
○ D: (1-1) and onto function.

14. If a set is closed with respect to an operation and the operation is associative then the set is called?

○ A: Semi group
○ B: Group
○ C: Monoid
○ D: Both A and C.

15. If A = {1, 2, 3} and B = {3, 4} and C = {4, 5, 6} then (A x B) ∩ (B x C) =?

○ A: {(1,4)}
○ B: {(3,4)}
○ C: {(1,4) , (3,4)}
○ D: {(2,4) , (1,3)}

16. The function f = {(1,2) , (1,3) , (1,4)} is a ?

○ A: Into function
○ B: Onto function
○ C: (1-1) onto function
○ D: None of the above.

17. Converse of $q \rightarrow p$ is?

○ A: $p \rightarrow q$
○ B: $\sim p \rightarrow \sim q$
○ C: $\sim q \rightarrow \sim p$
○ D: $\sim p \rightarrow q$

18. Set of all integers such that |x-3| < 2 is?

○ A: {1,2,3,4}
○ B: {1,2,3,4,5}
○ C: {2,3,4}
○ D: None of the above.

19. If A={1,2,3} , B = {1,2,3} and C = {3,2,1} which of the following is true?

○ A: A = B
○ B: C is inverse of A
○ C: A = B = C
○ D: Both A and B.

20. If A is a subset of B then A - B = ?

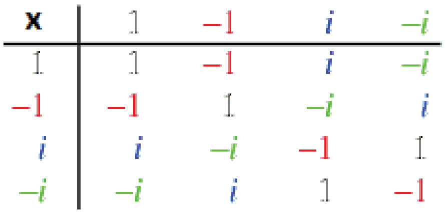
○ A: A
○ B: B
○ C: A - (A U B)
○ D: Φ

TEST 3

1. **In a town, 48% people are educated, 51% people are young, 60% are servicemen, 24% are educated and young, 25% are young and servicemen, 27% are educated and servicemen and 5% have all three characteristics. How many people (in percentage terms)do not have any of these three characteristics?**

   ○ A: 12%
   ○ B: 9%
   ○ C: 5%
   ○ D: 0%

2. **The table below shows multiplication operation on a set S = {1,-1,i,-i}. Which of the following is most accurate about the set w.r.t multiplication?**



x	1	−1	*i*	−*i*
1	1	−1	*i*	−*i*
−1	−1	1	−*i*	*i*
i	*i*	−*i*	−1	1
−*i*	−*i*	*i*	1	−1

   ○ A: It is a monoid
   ○ B: It is a group
   ○ C: It is an abelian group
   ○ D: It is a semi group

3. **In a zoo, there are 42 animals in the first sector, 34 in the second sector and 20 in the third sector. Out of these, 24 graze in sector one and also in sector two, 10 graze in sector two and sector three and 12 graze in sector one and sector three. These figures also include four animals grazing in all the three sectors. Find the total number of animals?**

   ○ A: 46
   ○ B: 50
   ○ C: 54
   ○ D: 60

4. **Let R be a relation in N defined by R = {(1+x , x^2) : x < 5 and x Є N}. Which of the following is false?**

   ○ A: Domain of R = {2,3,4,5}
   ○ B: Range of R = {4,9,16,25}
   ○ C: R = {(1,2) , (2,4) , (3,9) , (4,16) , (5,25)}
   ○ D: R = {(2,4) , (3,9) , (4,16) , (5,25)}

5. **For b Є N, bN = {bx : x Є N} then the first value of the set 6N ∩ 8N is?**

   ○ A: 8
   ○ B: 16
   ○ C: 24
   ○ D: 48

6. **Which of the following is a Singleton set?**

   ○ A: { x : |x|=5 , x Є N}
   ○ B: { x : |x|=15 , x Є Z}
   ○ C: { x : x^2 , x Є Z}
   ○ D: { x : 1 + x , x Є N}

7. **The set {x : x ≠ x} is?**

   ○ A: {0}
   ○ B: {Φ}
   ○ C: {1}
   ○ D: { }

8. **If N_a = {an : n Є N}, find the value of $N_6 \cap N_8$?**

   ○ A: N_6
   ○ B: N_8
   ○ C: N_{12}
   ○ D: N_{24}

9. **If n(A) = 115 , n(B) = 326 and n(A ∩ B) = 65. Then n(A U B) = ?**

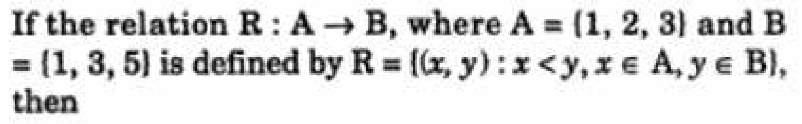
   ○ A: 68
   ○ B: 73
   ○ C: 128
   ○ D: 376

10. Which of the following cannot have a proper subset?

○ A: { x : x Є N} ○ B: { x : x Є Q, 3 < x < 4}

○ C: { x : x Є N, 3 < x < 4} ○ D: { x : x Є Z, 3 < x < 6}

11.



If the relation R : A → B, where A = {1, 2, 3} and B = {1, 3, 5} is defined by R = {(x, y) : x < y, x ∈ A, y ∈ B}, then

○ A: R = {(1,3) , (1,5) , (2,3) , (2,5) , (3,5)} ○ B: R = {(1,3) , (1,5) , (2,3) , (2,5) }

○ C: R^{-1} = {(3,1) , (5,1) , (3,2) , (5,2) , (3,3) } ○ D: R = {(1,1) , (1,3) , (1,5) , (2,3) , (2,5) }

12. Set of cube roots of unit w.r.t addition is?

○ A: Semi group ○ B: Group

○ C: Monoid ○ D: None of the above.

13. If X = {4^n – 3n – 1 : n Є N} and Y = {9 (n – 1) : n Є N}, find the value of X U Y?

○ A: X ○ B: Y

○ C: N ○ D: None of the above.

14. Let R by a relation in N defined by R = {(x,y) : x + 2y = 8}. The range of R is?

○ A: {2,4,6} ○ B: {1,2,3}

○ C: {2,4,6,8} ○ D: {1,2,3,4,5,6}

15. What are the missing entries in the conditional table below? (From top to bottom)

p	**q**	$p \rightarrow q$
T	T	?
T	F	?
F	T	?
F	F	?

○ A: T, F, F, T ○ B: T, T, T, F

○ C: T, F, T, F ○ D: T, F, T, T

16. The number of relations that can be defined on the set A = {a, b, c, d} is?

○ A: 16 ○ B: 24

○ C: 4^4 ○ D: 2^{16}

17. If n(A) = 115 , n(B) = 326 and n(A-B) = 47, then n(A ∩ B) = ?

○ A: 373 ○ B: 158

○ C: 68 ○ D: 44

18. Which of the following is an empty set?

○ A: { x : x Є R and $x^2 – 3 = 0$} ○ B: { x : x Є R and $x^2 + 3 = 0$}

○ C: { x : x Є R and x + 11 = 0} ○ D: { x : x Є R and $x^4 – 3 = 0$}

19. If for two sets A and B we have (A U B) = (A ∩ B) = B, then we have?

○ A: B = Φ and A ≠ Φ ○ B: A - B = Φ

○ C: B - A = Φ ○ D: A = B

20. The set of fourth roots of unity are closed with respect to?

○ A: Addition ○ B: Division

○ C: Subtraction ○ D: None of the above.

TEST 4

1. The inverse of function {(1,2) , (2,3) , (3,4)} is?

○ A: {(1,2) , (2,3) , (3,4)} ○ B: {(1,1/2) , (1/2,1/3) , (1/3,1/4)}

○ C: {(2,1) , (3,2) , (4,3)} ○ D: {(-1,-2) , (-2,-3) , (-3,-4)}

2. 46 in binary is?

○ A: 100110 ○ B: 101111

○ C: 101110 ○ D: 101010

3. In a town with a population of 5000, the number of people who are egg eaters is 3200. If 2500 are meat eaters and 1500 eat both egg and meat. How many of them eat neither meat nor egg?

○ A: 4200 ○ B: 1500

○ C: 800 ○ D: 500

4. If A = {1,2,3,4} then {(x,y) | x+y < 5} is a ?

○ A: Onto function ○ B: Into function

○ C: (1-1) and into function ` ○ D: Not a function.

5. If A and B are disjoint sets then A - B = ?

○ A: A ○ B: B

○ C: B – A ○ D: Both A and C.

6. A group is called abelian group if?

○ A: It is closed ○ B: It satisfies associativity

○ C: It has inverse as part of the group. ○ D: It satisfied commutativity.

7. Let A = {a, b, c}. Then, the range of the relation R = {(a, b), (a, c), (b, c)} defined on A is?

○ A: {a, b, c} ○ B: {a, b}

○ C: {a} ○ D: {b,c}

8. Contrapositive of $p \rightarrow q$ is?

○ A: $q \rightarrow p$ ○ B: $\sim p \rightarrow \sim q$

○ C: $\sim q \rightarrow \sim p$ ○ D: $\sim p \rightarrow q$

9. X = {0,1,2,3,4 .....} is a set of?

○ A: Natural numbers ○ B: Whole numbers

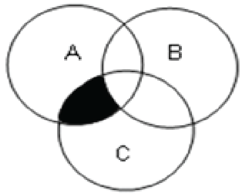
○ C: All integers ○ D: All of the above.

10. All Irish people drink beer. If someone is Irish he would definitely drink beer. The logic is an example of?

○ A: Proposition ○ B: Induction

○ C: Deduction ○ D: Logic analysis

The shaded area in this diagram represents

11. 

○ A: A ∩ C ○ B: (A ∩ B) – C

○ C: (A – C) ∩ (A – B) ○ D: (A ∩ C) – B

12. Set of natural numbers is closed with respect to?

Addition, Multiplication, Subtraction

○ A: i only ○ B: ii only

○ C: i and ii only ○ D: i, ii and iii

13. If a function f: A→B is such that Ran f = B then f is a/an ?

○ A: Into function ○ B: Onto function

○ C: (1 – 1) and onto ○ D: Both B and C.

14. A, B and C are three sets such that A ∪ B = A ∪ C and A ∩ B = A ∩ C. Which of the following conditions is true according to the given statement?

○ A: A = B ○ B: B = C

○ C: A = C ○ D: A = B = C

15. The set of cube roots of unit is closed with respect to?

○ A: Multiplication ○ B: Addition

○ C: Subtraction ○ D: None of the above.

16. If set A = {1,w,w^2} is an abelian group then inverse of w is?

○ A: 1 ○ B: w

○ C: w^2 ○ D: Abelian group does not have an inverse.

17. The range of the function f(x) = |x - 1| is? Where domain is the set of all integers.

○ A: (- ∞, ∞) ○ B: (0, ∞)

○ C: [0, ∞) ○ D: (- ∞, 0)

18. Which of the following is true about the null set?

It is the subset of every set. Number of elements in its power set is zero. It contains no elements

○ A: iii only ○ B: i and iii only

○ C: ii and iii only ○ D: i, ii and iii.

19. Z = {x | x ≠ p/q where p,q Є Z and q ≠ 0} is a set of?

○ A: Natural numbers ○ B: All integers

○ C: Irrational numbers ○ D: Rational numbers.

20. If A ∩ B ≠ Φ then (A U B) = ?

○ A: A + B ○ B: (A U B) = A + B - (A ∩ B)

○ C: (A U B) = A + B + (A ∩ B) ○ D: Φ

Matrices & Determinations

TEST 1

1. **Inverse of the matrix $\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ is?**

○ A: $10\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$ ○ B: $\frac{1}{10}\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$

○ C: $\frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$ ○ D: $10\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

2. **The matrix below has order of?**

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

○ A: 6 x 1 ○ B: 2 x 3

○ C: 3 x 2 ○ D: 2 x 2

3. **If *A* and *B* are matrices, then which from the following is true ?**

○ A: $A + B \neq B + A$ ○ B: $(A^t)^t \neq A$

○ C: $AB \neq BA$ ○ D: All are true.

4. **A squar matrix is one in which?**

○ A: $n = m^2$ ○ B: $n^2 = m$

○ C: $n = m$ ○ D: All numbers are squares of integers.

5. **The number of non-zero rows in an echlon form is called ?**

○ A: reduced echlon form ○ B: rank of the matrix

○ C: conjugate of the matrix ○ D: co-factor of the matrix

6. **M_{12} the matrix given below is?**

$$\begin{vmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{vmatrix}$$

○ A: $\begin{vmatrix} 2 & 1 \\ 1 & 2 \end{vmatrix}$ ○ B: $\begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix}$

○ C: $\begin{vmatrix} 2 & 1 \\ 1 & 1 \end{vmatrix}$ ○ D: $\begin{vmatrix} 1 & 2 \\ 1 & 1 \end{vmatrix}$

7. **The matrix given below is a?**

$$\begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 2 & 1 & 5 \end{bmatrix}$$

○ A: Symmetric. ○ B: Skew Symmetric

○ C: Hermitian ○ D: Skew Hermitian

8. What is the order of the matrix given below?

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$$

○ A: 6 x 1
○ B: 2 x 3
○ C: 3 x 2
○ D: 2 x 2

9. Determinant of singular matrix is ?

○ A: 1
○ B: positive
○ C: negative
○ D: 0

10. If the system of equations $x - Ky - z = 0$, $Kx - y - z = 0$, $x + y - z = 0$ has a non-zero solution, then the possible values of K are?

○ A: -1, 2
○ B: 1, 2
○ C: 0, 1
○ D: -1, 1

11. The following matrix is?

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{bmatrix}$$

○ A: Non singular
○ B: Unit matrix
○ C: Lower triangle.
○ D: Upper Triangle.

12. Value of $\begin{vmatrix} w & 1 & w \\ w & 2 & w \\ w & 3 & w \end{vmatrix}$ **is?**

○ A: w
○ B: 0
○ C: 1
○ D: 2

13. If A = $\begin{bmatrix} 2 & 5 \\ 5 & 2 \end{bmatrix}$**, then $A^3 - 4A^2$ is equal to**

○ A: $\begin{bmatrix} 42 & 105 \\ -105 & 42 \end{bmatrix}$
○ B: $\begin{bmatrix} 42 & 105 \\ 105 & 42 \end{bmatrix}$
○ C: $\begin{bmatrix} 105 & 42 \\ 105 & 42 \end{bmatrix}$
○ D: None of the above.

14. A determinant remains same if :

○ A: Every element in a column is multiplied by the same factor
○ B: Two columns are interchanged.
○ C: Two rows are interchanged.
○ D: Each element of any row is added to the corresponding element of any other row multiplied by given factor

15. For matrices $(AB)^t$ = ?

○ A: A^tB^t
○ B: AB
○ C: B^tA^t
○ D: BA

16. If A = $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A|$ is?

○ A: 2 ○ B: 3

○ C: 4 ○ D: 5

17. If AB = A then, B is a?

○ A: Unity Matrixq ○ B: Identity Matrix

○ C: Inverse of A ○ D: Both A & B.

18. If the order of matrix *A* is *m* x *p*. And the order of *B* is *p* x *n*. Then the order of *AB* is ?

○ A: m x p ○ B: p x n

○ C: m x n ○ D: n x m

19. For matrices A^{-1} = ?

○ A: $Adj\ A\ |A|$ ○ B: $|A|\ \frac{1}{Adj\ A}$

○ C: $\frac{1}{|A|\ A} Adj\ A$ ○ D: $\frac{1}{|A|} Adj\ A$

TEST 2

1. **Inverse for the matrix $a = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is?**

○ A: $\frac{1}{ad-bc}\begin{bmatrix} d & b \\ c & a \end{bmatrix}$ ○ B: $\frac{1}{ab-cd}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

○ C: $\frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ ○ D: $\frac{1}{ad-bc}\begin{bmatrix} -d & -b \\ -c & -a \end{bmatrix}$

2. **For matrices if AX = B then which of the following conditions holds?**

○ A: $X = A^{-1}B$ ○ B: $A^{-1}(AX) = BA^{-1}$

○ C: $X = BA^{-1}$ ○ D: All of the above.

3. **For matrices, if AX=B then X = ?**

○ A: B / |A| ○ B: $\frac{1}{|A|} * adj(A.B)$

○ C: $B.(\frac{1}{|A|} adj A)$ ○ D: $(\frac{1}{|A|} * adj A).B$

4. **Fine the cofactor A_{23} for the matrix $\begin{bmatrix} 5 & -2 & 7 \\ 6 & 1 & -9 \\ 4 & -3 & 8 \end{bmatrix}$**

○ A: 7 ○ B: 0

○ C: 23 ○ D: -7

5. The matrix $B = \begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & 0 \end{bmatrix}$ **can be defined as?**

○ A: Symmetric

`○ B: Skew Symmetric

○ C: Triangular

○ D: Hermitian

6. Find the cofactor A_{22} for the $\begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

○ A: 8

○ B: -7

○ C: -10

○ D: 3

7. If A is a square matrix, then A^{-1} does not exist if

○ A: $|A|>0$

○ B: $|A|<0$

○ C: $|A|=0$

○ D: $A\neq 0$

8. Value of determinance is?

○ A: 0

○ B: 1

○ C: x+y+z+w

○ D: xyzw

If

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

9. then order of matrix A = ?

○ A: 3 x 2

○ B: 2 x 3

○ C: 3 x 3

○ D: 2 x 2

10. The value of $\begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$ is

○ A: 8

○ B: -8

○ C: 400

○ D: 0

11. If I is an identity matrix, then?

○ A: $I^n=0$

○ B: $I^n=I$

○ C: $2I=0$

○ D: None of these.

12. If x, y and z are non zero numbers. The inverse of matrix $\begin{bmatrix} x & y \\ z & 1 \end{bmatrix}$ **is?**

○ A: $\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$

○ B: $\dfrac{1}{x-yz}\begin{bmatrix} 1 & -y \\ -z & x \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & -y \\ -z & -x \end{bmatrix}$

○ D: None of these.

13. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then?

○ A: $\alpha = a^2 + b^2, \beta = -2ab$ ○ B: $\alpha = a^2 + b^2, \beta = ab$

○ C: $\alpha = a^2 - b^2, \beta = 2ab$ ○ D: $\alpha = a^2 + b^2, \beta = 2ab$

14. If $A = \begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 23 \\ 0 & -10 \end{bmatrix}$ then |AB| is?

○ A: 80 ○ B: 100

○ C: -110 ○ D: 90

15. The number of non-zero rows when a matrix is reduced to echelon matrix form is known as?

○ A: Rank of the matrix. ○ B: Degree of matrix.

○ C: Skew echelon of matrix. ○ D: None of the above.

16. If augmented matrix of a system is of form $\begin{bmatrix} 1 & 0 & : & 5 \\ 0 & 1 & : & -3 \end{bmatrix}$ Solution to the equations of the system is?

○ A: 1 and 0 ○ B: 0 and 1

○ C: 5 and -3 ○ D: None of the above.

17. The value of the determinant given below is equal to

$$\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$$

○ A: 6 xyz ○ B: xyz

○ C: 4 xyz ○ D: xy + yz +zx

18. If a matrix A is multiplid with a number k then the determinant of resulting matrix is?

○ A: k |A| ○ B: 1/k |A|

○ C: k^2|A| ○ D: |A|

19. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ are

○ A: -3, 1 ○ B: -1, 3

○ C: 3, 1 ○ D: -3, -1

20. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ then A^2= ?

○ A: $\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$ ○ B: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

○ C: $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ ○ D: $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$

TEST 3

1. Let $\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$ then Δ lies in the interval

○ A: [2, 4]

○ B: [0, 4]

○ C: [1, 4]

○ D: None of these.

2. If A and B are symmetric matrices, then AB + BA is a?

○ A: Symmetric matrix

○ B: Skew symmetric matrix

○ C: Diagonal matrix

○ D: Triangular matrix

3. Which of the following is an Echelon form of a matrix?

○ A: $\begin{bmatrix} 0 & 1 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

○ B: $\begin{bmatrix} 1 & 2 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 0 & 2 & -2 \\ 0 & 0 & 1 \\ 0 & 0 & 8 \end{bmatrix}$

○ D: Both A & B.

4. 1, 2, 3, 4 are four numbers. If a matrix of order m x n is formed by using all the four numbers, then how many set of values (m, n) are possible?

○ A: 1

○ B: 2

○ C: 3

○ D: 4

5. If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

○ A: $\begin{bmatrix} 13 & 4 \\ 8 & 5 \end{bmatrix}$

○ B: $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

○ C: $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$

○ D: $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

6. If $D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for x, y not equal to zero, then D is

○ A: Divisible by neither x nor y.

○ B: Divisible by both x and y

○ C: Divisible by x but not y

○ D: Divisible by y but not x

7. $\begin{vmatrix} a+x & b & c \\ a & b+y & c \\ a & b & c+z \end{vmatrix}$ is equal to

○ A: $xyz\,(1 + a/x + b/y + c/z)$

○ B: $xyz\,(1 + x/a + y/b + z/c)$

○ C: $xyz\,(1 + x + y + z)$

○ D: $xyz\,(1 + a + b + c)$

Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$

8. If $|A|^2 = 25$, then $|\alpha|$ is equal to

○ A: 1/5q　　○ B: 5

○ C: 1　　○ D: 25

9. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ such that $A + A^C = I$, then value of α is

○ A: $\pi/6$　　○ B: $\pi/3$

○ C: π　　○ D: 0

10. Which is the following is the condition for a Skew Hermitian matrix?

○ A: $(\bar{A})^t = A$　　○ B: $(\bar{A})^t = A^2$

○ C: $(\bar{A})^t = -A$　　○ D: $\bar{A}^t = -A^2$

11. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$, where $a = i$, $b = \omega$, $c = \omega^2$, then Δ is equal to

○ A: I　　○ B: -1

○ C: 1　　○ D: -i

12. If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$, then f(100) is equal to

○ A: 0　　○ B: 1

○ C: 100　　○ D: -100

13. The solution set of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$ is

○ A: 1, 2, 3　　○ B: 1, 2, -3

○ C: -1, 2, 3　　○ D: -1, -2, 3

14. Which of the following is true for Echelon Form of a Matrix?

○ A: In any row, the number of zeros before the leading entry is greater than the number of such zeros in the preceding row.

○ B: All non zero rows preceeds row including zeros.

○ C: First entry in any non zero row is 1.

○ D: All of the above.

15. The matrix $A = \begin{bmatrix} 1 & 1-i \\ 1+i & 2 \end{bmatrix}$ is a?

○ A: Symmetric Matrix　　○ B: Hermitian Matrix

○ C: Skew symmetric matrix　　○ D: Skew hermitian matrix

16. The value of the determinate $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

○ A: 5√3 (-√6 – 5)

○ B: 5√3 (√6 – 5)

○ C: 5√3 (5 - √6)

○ D: √3 (√6 – 5)

17. If A and B are symmetric matrices, then AB would equal to?

○ A: -BA

○ B: BA

○ C: 0

○ D: I

18. In reduced echelon form of the matrix if first non zero entry of a row lies in Column j, all other entries in the column are?

○ A: Positive

○ B: Negative

○ C: Zero

○ D: None of the above.

TEST 4

1. For the matrix below find the |A|?

$$A = \begin{bmatrix} 5 & 3 & 2 \\ 0 & 4 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

○ A: 30

○ B: 40

○ C: 50

○ D: 60

2. A triangular matrix is always a?

○ A: Echelon form of Matrix.

○ B: Reduced Echelon form of Matrix.

○ C: Square matrix.

○ D: Non of the above.

3. What is the conjugate of matrix $A = \begin{bmatrix} i & 10+i \\ -2i & 1-i \end{bmatrix}$

○ A: $\begin{bmatrix} -i & 10+i \\ -2i & 1+i \end{bmatrix}$

○ B: $\begin{bmatrix} i & 10-i \\ 2i & 1-i \end{bmatrix}$

○ C: $\begin{bmatrix} -1 & 10-i \\ 2 & 1+i \end{bmatrix}$

○ D: $\begin{bmatrix} -i & 10-i \\ 2i & 1+i \end{bmatrix}$

4. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

○ A: α=1

○ B: α=0

○ C: α=-1

○ D: None of these.

5. The matrix A = $\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ can be described as?

○ A: Hermitian

○ B: Skew Hermitian

○ C: Symmetric

○ D: Skey Symmetric.

For a system of equations,

$x + 3y + 2z = 3$

$4x + 5y - 3z = -3$

$3x - 2y + 17z = 42$

6. Fine the values of x, y and z if the echelon form of matrix is $\begin{bmatrix} 1 & 3 & 2 & :3 \\ 0 & 1 & -1 & :-3 \\ 0 & 0 & 1 & :2 \end{bmatrix}$

○ A: x = 2 ; y = -1; z = 2

○ B: x = -2 ; y= 1; z= 2

○ C: x = 4 ; y = -1; z = 2

○ D: x= 2 ; y =-2; z = 2

7. Find the value of a if the following matrix is singular $\begin{bmatrix} -4 & 2 \\ -6 & a \end{bmatrix}$

○ A: -3

○ B: 3

○ C: 5

○ D: -5

8. If A=$\begin{bmatrix} 5 & x \\ y & 0 \end{bmatrix}$ and A is symmetric then?

○ A: x=0, y=5

○ B: x+y=5

○ C: x=y

○ D: None of the above.

9. Let $A = \begin{vmatrix} 1 & bc & a(b+c)) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b)) \end{vmatrix}$**. Value of A is equal to?**

○ A: ab + bc +ca

○ B: a + b + c

○ C: $(a + b + c)^2$

○ D: None of the above

10. If in a square matrix A two rows or two columns are interchanged the determinant of the resulting matrix is?

○ A: A^{-1}

○ B: -|A|

○ C: |A|

○ D: None of the above.

11. What is the rank of the matrix $A = \begin{bmatrix} 1 & 0 & 7 & -2 \\ 0 & 1 & 3 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

○ A: 1

○ B: 2

○ C: 3

○ D: 4

12. What is value of the determinant $A = \begin{vmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{vmatrix}$

○ A: 25
○ B: -25
○ C: 30
○ D: -30

13. If ω is the cube root of unity then the value of is ?

○ A: $a^3 + b^3 + c^3$
○ B: ab - bc
○ C: 0
○ D: $a^3 + b^3 + c^3$ -3abc

14. If x + ay = 0; y + az = 0; z + ax = 0, then the value of ‘a’ for which the system of equations will have infinite number of solutions is?

○ A: 1
○ B: 0
○ C: -1
○ D: None of these.

Quadratic Equations

TEST 1

1. Find the value of x where $9x^2 - 12x - 5 = 0$.

○ A: -1/3 , 5/3
○ B: -2/3 , 5/3
○ C: -1/3, 2/3
○ D: 2/3 , 5/3

2. $\omega^{-12} = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: 0

3. If $x-a$ is a factor of $f(x)$ then $f(a) = ?$

○ A: a
○ B: 0
○ C: 1
○ D: w

4. Solution to the equation $6x^2 + x - 15 = 0$ is?

○ A: 3/2 , -3/2
○ B: 6/7 , -4/5
○ C: 3/2 , -5/3
○ D: None of the above.

5. Roots of the equation $2x^2 + 5x - 1$ are?

○ A: Complex
○ B: Irrational
○ C: Equal
○ D: Rational

6. The condition for polynomial equation $ax^2 + bx + c = 0$ to be quadratic is?

○ A: $a > 0$
○ B: $a < 0$
○ C: $a \neq 0$
○ D: $a \neq 0$ and $b \neq 0$

7. If the product of the roots of the equation $mx^2 + 6x + (2m - 1) = 0$ is -1, the value of m is?

○ A: 1
○ B: -1
○ C: 1/3
○ D: -1/3

8. Quadratic equations are?

○ A: First degree polynomials.
○ B: Second degree polynomials.
○ C: Third degree polynomials.
○ D: Fourth degree polynomials.

9. $1 + \omega + \omega^2 = ?$

○ A: 1
○ B: ω
○ C: ω^2
○ D: 0

10. For quadratic equation $ax^2 + bx + c = 0$, Sum of roots is equal to?

○ A: b/a
○ B: -b/a
○ C: c/a
○ D: -c/a

11. If S and P are the sum and products of the roots of the quadratic equation, then the equation may be written as?

○ A: $x^2 + Sx + P = 0$
○ B: $x^2 - Sx - P = 0$
○ C: $x^2 - Sx + P = 0$
○ D: $x^2 + Sx - P = 0$

12. Roots of the equation $x^2 + 7x + 12$ are?

○ A: 3, 4 ○ B: -3, 4

○ C: 3, -4 ○ D: -3, -4

13. Sum of all fourth roots of unit is?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

14. Product of all fourth roots of unity are?

○ A: 1 ○ B: -1

○ C: 0 ○ D: *i*

15. $\frac{-1+\sqrt{3}i}{2} * \frac{-1-\sqrt{3}i}{2}$ **= ?**

○ A: $\frac{-1+\sqrt{3}i}{2}$ ○ B: $\frac{-1-\sqrt{3}i}{2}$

○ C: 1 ○ D: 0

16. The solution for equation $x^2 - x = 2$ is?

○ A: 1 , -2 ○ B: -1, 4

○ C: 2, -1 ○ D: 2, -3

TEST 2

1. The degree of the equation $x^4 + 1/x^4 - 3 = 0$ is?

○ A: 4
○ B: 6
○ C: 8
○ D: None of the above.

2. $x + 2$ is a factor of ?

○ A: $x^4 + 2$
○ B: $x^4 - x^2 + 12$
○ C: $x^4 - 2x^3 - x + 2$
○ D: $x^4 + 2x^3 - x - 2$

3. If the equation $x^3 + 4x^2 - 2x + 5$ is divided by $x-1$ the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

4. $\omega^{-5} = ?$

○ A: ω
○ B: ω^2
○ C: 1
○ D: None of the above.

5. The equation $\sqrt{x+3} + \sqrt{x+5} = \sqrt{3x+2}$ is called?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal equation
○ D: Square root equation.

6. The equation $2^{2x} + 4^x - 10 = 0$ is?

○ A: Radical equation
○ B: Exponential equation
○ C: Reciprocal
○ D: None of the above.

7. Out of the three cube roots of unit, how many are imaginary?

○ A: 1
○ B: 2
○ C: 3
○ D: Zero

8. If ω is the complex cube root of unity then $\omega = ?$

○ A: 0
○ B: 1
○ C: ω^2
○ D: ω^{-1}

9. If $x^2 + 1/x^2 = 27$, then the value of $x - 1/x$ is equal to ?

○ A: 5
○ B: 4
○ C: 3
○ D: 2

10. If the equation $x^3 + 4x^2 - 2x + 5 = 0$ is divided by $x+1$ the remainder is?

○ A: 10
○ B: 9
○ C: 8
○ D: 7

11. If one root of the equation $x^2 + px + q = 0$ is double the other, p^2/q is?

○ A: 1
○ B: 1/2
○ C: 2/9
○ D: 9/2

12. Roots of the equation $x^2 + 2x + 3 = 0$ are?

○ A: Unequal ○ B: Real

○ C: Complex ○ D: Both A & C.

13. If one root of the equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots, then the value of q is?

○ A: 12 ○ B: 4

○ C: 23/6 ○ D: 49/4

14. $1/\omega$ = ?

○ A: ω ○ B: ω^2

○ C: 1 ○ D: 0

15. If the roots of $ax^2 + b = 0$ are real and distinct, then?

○ A: $ab > 0$ ○ B: $a = 0$

○ C: $a > 0$ and $b < 0$ ○ D: $ab < 0$

16. If $b^2 - 4ac$ for a quadratic equation is a perfect square the roots are?

○ A: Rational ○ B: Irrational

○ C: Complex ○ D: None of these.

17. Cube roots of 8 are?

○ A: -2, $-2w$ and $-2w^2$ ○ B: 2, $2w$ and $2w^2$

○ C: 2, w and w^2 ○ D: 1, w and w^2

18. The roots of the equation $9x^2 - 12x + 4 = 0$ are?

○ A: Equal ○ B: Complex

○ C: Irrational ○ D: Unequal

19. If j and k are the roots of the equation $2x^2 - 4x + 5 = 0$ then $(j+1)(k+1)$ = ?

○ A: 11/2 ○ B: -11/2

○ C: 2/11 ○ D: -2/11

20. $x^4 - 2x^3 + 8x^2 - 2x + 1$ is called?

○ A: Radical equation ○ B: Exponential equation

○ C: Reciprocal equation ○ D: None of the above.

TEST 3

1. **$(1 + w - w^2)^8$ = ? where w is cube root of unity.**

○ A: $256w^2$
○ B: $-256w^2$
○ C: $256w$
○ D: $-256w$

2. **For what value of m the given equation would have equal root.**

$(m + 1)x^2 + 2(m+3)x + m + 8 = 0$

○ A: ½
○ B: 1/3
○ C: -1/3
○ D: 2/3

3. **The number of real solutions of $|x|^2 + 3|x| + 2 = 0$ is?**

○ A: 1
○ B: 2
○ C: 3
○ D: 0

4. **The roots of equation $x^2 + k = 0$, $k < 0$, are?**

○ A: Complex conjugates
○ B: Real and distinct
○ C: Real and same
○ D: Rational

5. **The value of a for which the equations $x^3 + ax + 1 = 0$ and $x^4 + ax^2 + 1 = 0$ have a common root is**

○ A: 2
○ B: -2
○ C: 0
○ D: None of these.

6. **If the roots of the equation $ax^2 + bx + c = 0$ are such that their sum is equal to the sum of their squares, then?**

○ A: $2ac = ab + b^2$
○ B: $2ac = a^2 + b^2$
○ C: $2ac = ab + b^3$
○ D: None of the above.

If α, β be the roots of $x^2 - 2x + 4 = 0$, $(\alpha^5 + \beta^5)$ = ?

Hint: $(\alpha^3 + \beta^3)(\alpha^2 + \beta^2) = \alpha^5 + \beta^5 + \alpha^2\beta^2(\alpha + \beta)$.

○ A: 243
○ B: 81
○ C: 64
○ D: 32

7. **If the equation $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a common non-zero root, the value of λ is?**

○ A: -1
○ B: 1
○ C: 3
○ D: -3

8. **The number of real roots of $(x + 1/x)^3 + (x + 1/x) = 0$ is**

○ A: 0
○ B: 2
○ C: 4
○ D: 6

9. **If $x^2 + ax + b = 0$ and $x^2 + bx + a = 0$ have a common root, the value of (a + b) is?**

○ A: 1
○ B: -1
○ C: 2
○ D: 1/2

10. **If α and β are the roots of the equation $ax^2 + bx + c$, what is equation with roots 1/α and 1/β?**

○ A: $cy^2 + by - a = 0$
○ B: $cy^2 - by - a = 0$
○ C: $y^2 + by + a = 0$
○ D: $cy^2 + by + a = 0$

11. If $x = (3 + \sqrt{5})$, the value of $(2x^3 - 9x^2 - 10x + 13)$ is ?

○ A: 0
○ B: 1
○ C: $12\sqrt{5}$
○ D: None of the above.

12. If α, β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^3 + \beta^3$ is equal to

○ A: -1
○ B: 0
○ C: 1
○ D: 2

13. If one root of the equation $ax^2 + bx + c = 0$ is twice the other, then?

○ A: $2b^2 = 9ac$
○ B: $b^2 = 4ac$
○ C: $b^2 = 9ac$
○ D: $3b^2 = ac$

14. Only one of the root of the equation $ax^2 + bx + c = 0$, is zero, and $a \neq 0$ if,

○ A: $c = 0$
○ B: $c = 0$ and $b \neq 0$
○ C: $b = 0$ and $c = 0$
○ D: $b \neq 0$ and $c \neq 0$

15. If α and β are the roots of equation $ax^2 + bx + c = 0$ the value of $\alpha^2 + \beta^2$ is?

○ A: $\frac{b^2 + 2ca}{a^2}$
○ B: $\frac{b^2 - 2ca}{a}$
○ C: $\frac{b^2 - 2ca}{a^2}$
○ D: $\frac{b - 2ca}{a^2}$

16. If $a > 0$ and $x = \sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \ldots\ldots\ldots\ldots\infty}}}}$, the value of x is

○ A: $\frac{\sqrt{4a - 1}}{2}$
○ B: $\frac{1 \pm \sqrt{4a + 1}}{2}$
○ C: $\frac{-1 \pm \sqrt{4a + 1}}{2}$
○ D: $\frac{-2 \pm \sqrt{4a + 1}}{2}$

17. The roots of the equation $3^{2x+3} + 37 = 10\,(73.3^x + 1)$ are?

○ A: 2, -2
○ B: 3 , -3
○ C: 8 , 1/9
○ D: 3 , 1/3

18. Roots of the equation $x^2 + 5x - 1 = 0$ are?

○ A: Rational
○ B: Irrational
○ C: Complex
○ D: None of the above.

19. If $\alpha + \beta = 4$ and $\alpha^3 + \beta^3 = 44$, α, β are the roots of ?

○ A: $2x^2 - 7x + 16 = 0$
○ B: $3x^2 + 9x + 11 = 0$
○ C: $9x^2 - 27x + 20 = 0$
○ D: None of the above.

TEST 4

1. The equation $x^5 + x^3 + 2x + 1 = 0$ has

○ A: No positive roots
○ B: Some positive roots
○ C: No negative roots
○ D: None of the above.

2. $(-1+\sqrt{-3})^4 + (-1-\sqrt{-3})^4 = ?$

○ A: 16ω
○ B: -16
○ C: 16
○ D: $16\omega^2$

3. For quadratic equations, If $b^2 - 4ac$ is a perfect square then the roots are?

○ A: Rational
○ B: Irrational
○ C: Equal
○ D: Complex

4. The number of real roots of the equation $x^6 - 7x^3 - 8 = 0$ is?

○ A: 1
○ B: 2
○ C: 3
○ D: 6

5. If $x^3 + kx^2 -7x + 6$ is divided by x + 2, the remainder is -8. The value of k is?

○ A: 5
○ B: -5
○ C: 1
○ D: -1

6. If the polynomial $x^4 + 5x^3 + 3x^2 - 5x - 58$ is divided by (x - 2), then the quotient must be?

○ A: $x^3 + 5x^2 + 17$
○ B: $x^3 + 3x + 5$
○ C: $x^3 + 7x^2 + 17x + 29$
○ D: $x^3 + 17x + 29$

7. If $x^3 + x^2 + x + 1 = 0$ then possible values of x are?

○ A: 1, i, -I
○ B: -1, i^2, -i
○ C: -1, i, -I
○ D: None of the above.

8. If x +1/x = 1 then $x^3 + 1/x^3$ is equal to

○ A: 1
○ B: -1
○ C: 2
○ D: -2

9. If two of the four roots of 625 are 5 and 5i then the other two roots are?

○ A: -5, -5i
○ B: 5, 5i
○ C: -25, -25i
○ D: None of the above.

10. $(x + \omega y) . (x + \omega^2 y) = ?$

○ A: $x^2 - 2xy + y^2$
○ B: $x^2 + 2xy + y^2$
○ C: $x^2 + xy + y^2$
○ D: $x^2 - xy + y^2$

11. If 5 + i be one of the roots of a given equation f(x) = 0 with real coefficients, then the lowest degree of such an equation must be?

○ A: 2
○ B: 3
○ C: 6
○ D: Not enough information given to answer the question.

12. $\left(\frac{-1-\sqrt{3}i}{2}\right)^2$ = ?

○ A: $\left(\frac{-1+\sqrt{3}i}{2}\right)$ ○ B: 1

○ C: $\left(\frac{-1+i}{2}\right)$ ○ D: $\left(\frac{-1-i}{2}\right)$

13. If α, β are the roots of the equation $x^2 + x + 1 = 0$, the equation whose roots are α / β and β / α is?

○ A: $x^2 + x + 1 = 0$ ○ B: $x^2 - x + 1 = 0$

○ C: $x^2 + x - 1 = 0$ ○ D: $x^2 - x - 1 = 0$

14. $1 + \omega^4$ = ?

○ A: $1 + \omega$ ○ B: $-\omega^2$

○ C: 1 ○ D: Both A and B.

15. if x + y = 7 and $x^2 - xy + y^2 = 13$; What are the values of x and y?

○ A: (1,2) (-1,3) ○ B: (4,5) (-2,3)

○ C: (1,5) (2,5) ○ D: (4,3) (3,4)

16. An expression of the type $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0 = 0$ is called

○ A: Polynomial of degree ○ B: Polynomial of degree 1

○ C: Polynomial of degree 2 ○ D: Polynomial of degree n

17. If the equations $x^2 + ax + b = 0$ and $x^2 + Ax + B = 0$ have a common root say ' t ', ' t ' must be equal to?

○ A: (B - b) / (a - A) ○ B: (a - A) / (b - B)

○ C: (a + A) / (B - b) ○ D: None of the above.

18. If 2 + i√3 is a root of the equation $x^2 + px + q = 0$ (p & q being real), then p + q is equal to?

○ A: 3 ○ B: -3

○ C: √3 ○ D: - √3

19. The roots of the equation $12x^2 + mx + 5 = 0$ will be in the ratio 3 : 2, if m is equal to

○ A: 1/12 ○ B: 5/12

○ C: 5 √ 10 ○ D: 5/12 √ 10

Sequences & Series

TEST 1

1. **If a series has a common ratio between two terms. It is called?**

○ A: Geometric series. ○ B: Arithmetic series
○ C: Harmonic series ○ D: None of the above.

2. **Sum of infinite GP does not exist if?**

○ A: $|r| < 1$ ○ B: $|r| > 1$
○ C: $|r| = 1$ ○ D: Both B & C.

3. **Sum of infinite geometric series exists if?**

○ A: $|r| < 1$ ○ B: $|r| > 1$
○ C: $|r| = 1$ ○ D: $|r| = -1$

4. **If the sum of first n positive integers is 1/5 times the sum of their square. Then n equals?**

○ A: 5 ○ B: 6
○ C: 7 ○ D: 8

5. **Find next term for the series,**
1, -3, 5, -7, 9, ?

○ A: -9 ○ B: -11
○ C: -13 ○ D: -15

6. **If AP has a=1, $t_n = 20$ and $S_n = 399$, then the value of n is?**

○ A: 20 ○ B: 32
○ C: 38 ○ D: 40

7. **The 6th term of HP is 1/61 and tenth term is 1/105. The first term of HP is?**

○ A: 1/39 ○ B: 1/28
○ C: 1/17 ○ D: 1/6

8. **What are the number of terms in an AP if $a_1=3$, d=7 and $a_n=59$.**

○ A: 6 ○ B: 7
○ C: 8 ○ D: 9

9. **If first two terms of H.P are 1/2 and 1/4 then fourth term is?**

○ A: 1/6 ○ B: 1/8
○ C: 1/10 ○ D: 1/12

10. **Write the first four terms of the arithmetic sequence if $a_1 = 5$ and other three consecutive terms are** 23,26,29.?

○ A: 5, 10, 15, 20 ○ B: 5,8,11,14
○ C: 5, 9, 13, 17 ○ D: None of the above.

11. 3, 6, 12 is?

○ A: AP
○ B: GP
○ C: HP
○ D: None of the above.

12. 5th term of the GP 3, 6, 12 is?

○ A: 32
○ B: 36
○ C: 42
○ D: 48

13. If the first and the sixth terms of a G.P are 2 and 64, then its common ratio is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

14. If $x = 1 + y + y^2$ .... infinity. The value of y is?

○ A: $x / (x-1)$
○ B: $x / (1-x)$
○ C: $(x-1) / x$
○ D: $(1-x) / x$

15. Arithmetic mean is given by formula?

○ A: $(ab)^{1/2}$
○ B: $ab / (a + b)$
○ C: $(a + b) / 2$
○ D: None of the above.

16. Arithmetic mean between $1 - x + x^3$ and $1 + x + x^3$ is?

○ A: $1 + x^3$
○ B: $1 - x^3$
○ C: $1 + x$
○ D: $1 - x$

17. nth term of GP is given by formula?

○ A: $a_n=a_1r^n$
○ B: $a_n=a_1r^{n+1}$
○ C: $a_n=a_1r^{n-1}$
○ D: $a_n=a_1r^{n-2}$

18. The harmonic mean of $a / (1 - ab)$ and $a / (1 + ab)$ is?

○ A: $a / (1 - ab)$
○ B: $a / (1 - a^2b^2)$
○ C: a
○ D: $1 / (1 - a^2b^2)$

19. An infinite GP is oscillatory if?

○ A: $|r| < 1$
○ B: $|r| > 1$
○ C: $|r| = 1$
○ D: $|r| = -1$

20. What is the geometric mean between -2i and 8i?

○ A: ±4
○ B: ±4i
○ C: 3i
○ D: 8i

TEST 2

1. If the numbers a, b, c, d, e form an A.P then the value of a - 4b + 6c - 4d + e is?

○ A: 1
○ B: 2
○ C: 0
○ D: None of the above.

2. $$\sum_{k=1}^{n} k^2 = ?$$

○ A: n
○ B: n(n+1) / 2
○ C: n(n+1)(2n+1) / 6
○ D: $[\ n(n+1)/2\ ]^2$

3. If 5 is HM between 2 and b then the value of b is?

○ A: 12.5
○ B: 10
○ C: -10
○ D: 8

4. What is the common ratio if a_4 = 8/27 and a_7 = -64/729?

○ A: ¼
○ B: -1/3
○ C: -2/3
○ D: -3/7

5. If x, y, z are in A.P, then (x + 2y - z) (2y + z - x) (z + x - y) = ?

○ A: xyz
○ B: 2xyz
○ C: 4xyz
○ D: 6xyz

6. If | x | < 1 and $y = x + x^2 + x^3 + \ldots\ldots \infty$, then x is equal to?

○ A: 0
○ B: xy
○ C: y / (1-y)
○ D: y / (1+y)

7. The sum of the series √3 + 1/√3 + 1/3√3 .... ∞ is equal to ?

○ A: √3 / 2
○ B: 3√3 / 2
○ C: 3
○ D: √3

8. If a, b, c are in A.P as well as in G.P then?

○ A: a = b ≠ c
○ B: a ≠ b = c
○ C: a ≠ b ≠ c
○ D: a = b = c

9. The nth terms of the two series: 3 + 10 + 17 + ------- and 63 + 65 + 67+......... are equal. Then the value of n is?

○ A: 9
○ B: 13
○ C: 19
○ D: 21

10. If the quadratic equation $(b^2 + c^2)x^2 - 2(a + b)cx + (c^2 + a^2) = 0$ has equal roots, then

○ A: a, b, c are in G.P
○ B: a, b, c are in A.P
○ C: a, c, b are in G.P
○ D: a, c, b are in A.P

The harmonic mean of the roots of the equation

11. $(5+\sqrt{2})x^2-(4+\sqrt{5})x+8+2\sqrt{5}=0$ is

○ A: 2
○ B: 4
○ C: 6
○ D: 8

12. If $a_n = (-3)\,(2/5)^n$ what the value of a_1 and r for the GP?

○ A: -6/5 and 2/5
○ B: 6/5 and 2/5
○ C: 3/8 and 1/5
○ D: -3/8 and 1/5

13. If in an AP $a_{25} - a_{20} = 45$, then d is equal to?

○ A: 9
○ B: -9
○ C: 18
○ D: 23

14. If $\frac{1}{x+y}$, $\frac{1}{2y}$, $\frac{1}{y+z}$ are in H.P, then x, y, z are in

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

15. For AP $T_{18} - T_8 = ?$

○ A: d
○ B: 2d
○ C: 10d
○ D: 26d

16. The value of the recurring fraction $0.0\overline{102}$ is?

○ A: 17 / 1665
○ B: 102 / 9999
○ C: 102 / 10000
○ D: 34 / 3339

17. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots\ldots\ldots + 100^3)^{1/2} \div 100$ is?

○ A: √100
○ B: 100
○ C: 100.5
○ D: 50.5

18. If a, b, c, d, e, f are A.Ms (Arithmetic Means) between 2 and 12, then a + b + c + d + e + f is equal to?

○ A: 14
○ B: 42
○ C: 64
○ D: 82

19. The number of terms between 30 and 530, which are divisible by 11, is?

○ A: 30
○ B: 40
○ C: 46
○ D: 52

20. Find the sum of infinite GP 2, √2, 1 .....

○ A: 4 + √2
○ B: 2 + 2√2
○ C: 4 + 2√2
○ D: 2+ 7√2

TEST 3

1. **If $a^x = b^y = c^z = d^t$ and a, b, c, d are in G.P then x, y, z, and t are in?**

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of these.

2. **If a^2, b^2, c^2 are in A.P., then $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in**

○ A: G.P
○ B: H.P
○ C: A.P
○ D: None of the above.

3. **If mth term of H.P is n and nth term is m, then (m+n)th term is?**

○ A: mn / (m+n)
○ B: m / (m+n)
○ C: n / (m+n)
○ D: (m-n) / (m+n)

4. **If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to**

○ A: 0
○ B: 1
○ C: 2
○ D: 3

5. **If $\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx}$ $(x \neq 0)$, then a, b, c, d are in**

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of these.

6. **If m^{th} term of an A.P is n and n^{th} term is m, then the $(m + n)^{th}$ term is ?**

○ A: 0
○ B: 1
○ C: -1
○ D: 2

7. **If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$, and $b \neq a + c$, then a, b, c are**

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

8. **If $x = \sum_{n=0}^{\infty} a^n, y = \sum_{n=0}^{\infty} b^n, z = \sum_{n=0}^{\infty} (ab)^n$, where $|a|, |b| < 1$, then**

○ A: xyz = x + y + z
○ B: xy + z = xz + yz
○ C: xy + yz = xz + y
○ D: xy + xz = yz + x

9. **If $a^x = b^y = c^z$ and a, b, c are in G.P then x, y, z are in?**

○ A: A.P
○ B: H.P
○ C: G.P
○ D: None of the above.

10. If a, b, c are in H.P., then the straight line $\frac{x}{a} + \frac{y}{b} + \frac{1}{c} = 0$ always passes through a fixed point and that point is

○ A: (-1. -2)
○ B: (-1, 2)
○ C: (1, -2)
○ D: (1, 2)

11. The harmonic mean of two numbers is 4. Their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 27$, the numbers are

○ A: 2, 15
○ B: 9, 12
○ C: 6, 3
○ D: 4, 8

12. Between 1 and 31 are inserted m arithmetic means, so that the ratio of the 7th and $(m - 1)$th means is 5 : 9. Then the value of m is

○ A: 12
○ B: 13
○ C: 14
○ D: 15

13. If $a_1, a_2, a_3, \ldots\ldots$ are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \ldots\ldots + a_{23} + a_{24}$ is equal to

○ A: 75
○ B: 430
○ C: 864
○ D: 900

14. If the sum of an infinite G.P is 3 and the sum of the squares of its terms is also 3, then its first term and common ratio are?

○ A: 3/2, ½
○ B: 4/7, 1/3
○ C: 1, 1/2
○ D: 1/8, 3/8

15. If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P., then

○ A: p, q, r are in A.P
○ B: q^2, p^2, r^2 are in A.P
○ C: p^2, q^2, r^2 are in A.P
○ D: p, r, q are in A.P

16. If $I_n = \int_0^{\pi/4} \tan^n x \sec^2 x \, dx$, then $I_1, I_2, I_3, \ldots\ldots$ are in

○ A: A.P
○ B: G.P
○ C: H.P
○ D: None of the above.

17. The sum of integers from 1 to 100 which are not divisible by 3 or 5 is?

○ A: 2438
○ B: 4745
○ C: 2317
○ D: 2632

18. The sum of all the odd numbers of four digits which are divisible by 9 is ?

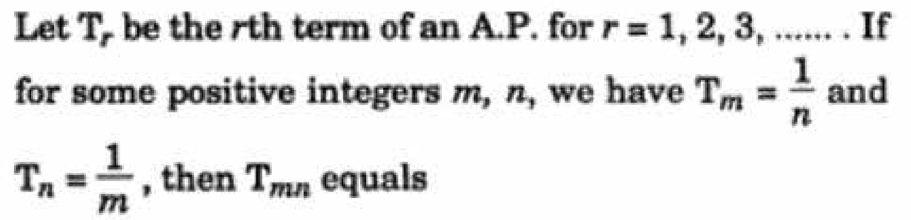
○ A: 11007000 ○ B: 4362000

○ C: 6743000 ○ D: 2754000

19. The sum of 100 terms of the series $1^2 - 2^2 + 3^2 - 4^2 + \ldots\ldots.$ is?

○ A: -5050 ○ B: -4720

○ C: -3870 ○ D: -2490

20. 

Let T_r be the rth term of an A.P. for $r = 1, 2, 3, \ldots\ldots$. If for some positive integers m, n, we have $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then T_{mn} equals

○ A: 1 ○ B: 0

○ C: 1 / mn ○ D: 1/m + 1/n

TEST 4

1. 1 + 2 + 3 + 4 + ... n =?

○ A: n

○ B: n(n+1) / 2

○ C: n(n+1) / 6

○ D: n(n+1)(2n+1) / 6

2. If 5 and 8 are two AMs between a and b. What is the value of a and b?

○ A: 3, 14

○ B: 2, 11

○ C: 4, 13

○ D: 2, 16

3. If a, b, c, d, e, f are in arithmetic progression, then e - c = ?

○ A: 2(c - a)

○ B: 2(d - c)

○ C: 2(f - d)

○ D: d - c

4. If a_{n-2} term of an AP is 3n-11. What is the nth term of the sequence?

○ A: 2n – 8

○ B: 3n + 8

○ C: 3n – 5

○ D: 7n + 12

5. If |r| < 1 then the sum of n terms of GP are given by?

○ A: $S_n = a_1 (1 + r^n) / (1 - r)$

○ B: $S_n = a_1 (1 - r)^n / (1 - r)$

○ C: $S_n = a_1 (1 - r^n) / (1 - r)$

○ D: $S_n = a_1 (1 - r^n) / (1 + r)$

6. **The first term of an A.P of consecutive numbers is $p^2 + 1$. The sum of 2p + 1 terms of this series can be expressed as?**

○ A: $(p+1)^2$

○ B: $(p+1)^3$

○ C: $(2p +1) * (p+1)^2$

○ D: $p^3 + (p+1)^3$

7. The sum of first n terms of the series 1/2 + 3/4 + 7/8 + 15/16 + ... is equal to?

○ A: $2^n - n + 1$

○ B: $1 - 2^n$

○ C: $n + 2^{-n} – 1$

○ D: $2^n - 1$

8. The value of $0.4\overline{23}$ is

○ A: 419 / 999

○ B: 419 / 990

○ C: 423 / 1000

○ D: None of the above.

9. If |r| > 1 then the sum of n terms in a GP are given by formula?

○ A: $S_n = a_1 (r^n – 1) / (r + 1)$

○ B: $S_n = a_1 (r^n – 1) / (1 - r)$

○ C: $S_n = a_1 (1 - r^n) / (1 - r)$

○ D: $S_n = a_1 (r^n – 1) / (r - 1)$

10. Fine the 7th term of the series 2, 6, 11, 17, ...

○ A: 41

○ B: 47

○ C: 53

○ D: 62

11. Arithmetic mean between 3√5 and 5√5 is?

○ A: 4√5 ○ B: 8√5

○ C: 5√15 ○ D: 15√5

12. Harmonic mean between 3 and 7 is?

○ A: 7/3 ○ B: 3/7

○ C: 21/5 ○ D: 32/7

13. If k + 2, 4k - 6 and 3k - 2 are three consecutive terms of an A.P, then k is equal to?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

14. If sum of the series $1 + \frac{3}{x} + \frac{9}{x^2} + \frac{27}{x^3} + \ldots \infty$ is a finite number, then

○ A: $x < 3$ ○ B: $x > 1/3$

○ C: $x < 1/3$ ○ D: $x > 3$

15. If G.P consists of even number of terms and sum of all terms is equal to 5 times the sum of terms in odd places (meaning term 1, 3, 5, ...) then common ratio will be?

○ A: 3 ○ B: 4

○ C: 5 ○ D: 6

16. If a series has common difference between two consecutive numbers. It is called?

○ A: Geometric progression ○ B: Arithmetric progression

○ C: Harmonic progression ○ D: None of the above.

17. Which term of the AP 92, 88, 84, 80 ... is zero?

○ A: 22 ○ B: 23

○ C: 24 ○ D: 34

18. The angles of a triangle are in A.P. If the least angle is 30^0 the greatest angle is?

○ A: 45^0 ○ B: 60^0

○ C: 75^0 ○ D: 90^0

19. If a, b, c are in A.P, b - a, c - b and a are in G.P, then a : b : c is ?

○ A: 1:2:3 ○ B: 1:4:9

○ C: 2:3:4 ○ D: 1:2:4

20. If n arithmetic means are added between 2 and 38 and the sum of resulting series is 200. Then the value of n is?

○ A: 6 ○ B: 8

○ C: 9 ○ D: 10

Probability & Permutations

TEST 1

1. If there are 3 roads from Lahore to Gujranwala and 4 roads from Gujranwala to Islamabad. How many different routes are there from Lahore to Islamabad?

○ A: 4 ○ B: 10

○ C: 12 ○ D: 18

2. If $^nC_8 = {}^nC_{12}$, What is value of n?

○ A: 5 ○ B: 10

○ C: 20 ○ D: Cannot be determined.

3. If the probability to score a century in any given match is 0.04. How many centuries the batsmen would make in 50 matches?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 3

4. When a dice is rolled thrice, the probability of getting a number less than 5 in each roll is?

○ A: 1/216 ○ B: 8/27

○ C: 130/216 ○ D: 125/216

5. A club has 20 members and you want to select the president and vice president for the club. How many different outcomes are possible if president and vice president cannot be the same person?

○ A: 370 ○ B: 380

○ C: 390 ○ D: 398

6. There are n points on a circle. The number of straight lines obtained by joining them is?

○ A: $^nC_3$ ○ B: $^nC_2$

○ C: $^nC_2 - n$ ○ D: ^nC_n

7. Probability of occurance for one of the four equally likely events would be?

○ A: 0 ○ B: 0.25

○ C: 0.75 ○ D: 1

8. What is the probability of getting a sum 9 from two throws of a dice?

○ A: 1/6 ○ B: 1/8

○ C: 1/9 ○ D: 1/12

9. The number of ways of painting the faces of a cube with six different colours is?

○ A: 1 ○ B: 6

○ C: 6! ○ D: None of the above.

10. Which of the following is true?

n! = n(n-1)!,   0! = 0,   4! = 4.3.2.1

○ A: iii only ○ B: i and ii only

○ C: i and iii only ○ D: i, ii and iii

11. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

○ A: 5/7
○ B: 2/7
○ C: 3/5
○ D: 2/5

12. A husband and a wife appear in an interview for the same post. The probability of husband's selection is 1/7 and that of wife's selection is 1/5. What is the probability that none of them will be selected?

○ A: 12/35
○ B: 34/35
○ C: 24/35
○ D: None of the above.

13. If you role a dice twice. What is the probability that you would get 6 both the times?

○ A: 1/3
○ B: 1/6
○ C: 1/12
○ D: 1/36

14. If A and B are two independent sets then $P(A \cap B)$ = ?

○ A: $P(A) + P(B)$
○ B: $P(A) * P(B)$
○ C: $P(A) + P(B) – P(A \cup B)$
○ D: $P(A)$

15. The number of diagonals of a hexagon is?

○ A: 6
○ B: 9
○ C: 15
○ D: 18

16. The number of ways of selecting 2 candidates out of 5 equally qualified candidates for a post is?

○ A: 10
○ B: 8
○ C: 5
○ D: 20

17. P, Q, R and S are to give lectures to an audience. The organizer can arrange the order of their presentations in how many ways?

○ A: 4
○ B: 8
○ C: 12
○ D: 24

18. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: $(p+q)!$
○ B: $(p+q)! / p!$
○ C: $(p+q)! / q!$
○ D: $(p+q)! / p!q!$

19. A set with all possible outcomes of an experiment is called?

○ A: Probability function
○ B: Event space
○ C: Sample space
○ D: Both B and C.

20. $9! / (6!3!)$ = ?

○ A: 72
○ B: 84
○ C: 96
○ D: 108

TEST 2

1. **The total number of different combinations of names which can be made from the letters of the word MISSISSIPPI, using all the letters at a time?**

○ A: 4!x 4!x 2! ○ B: 11! / (4!x 4!x 2!)
○ C: 11! / (10!) ○ D: 11!

2. **A work is given to 3 men and their probabilities for doing the work are 1/7, 1/4, 1/6 respectively. Find the probability that the work is done?**

○ A: 39/84 ○ B: 1/168
○ C: 167/168 ○ D: 23/89

3. **Three identical dice are rolled. The probability that the same number will appear on each of them is?**

○ A: 1/6 ○ B: 1/36
○ C: 1/216 ○ D: 3/216

4. **The number of subsets of a set containing n distinct objects is?**

○ A: ${}^nC_1 + {}^nC_2 + {}^nC_3 + \ldots\ldots + {}^nC_n$ ○ B: ${}^nC_0 + {}^nC_1 + {}^nC_2 + \ldots\ldots + {}^nC_n$
○ C: $2^n + 1$ ○ D: None of the above.

5. **The odds against drawing 2 red balls from a bag containing 3 red and 2 white balls is?**

○ A: 1 : 2 ○ B: 3 : 7
○ C: 7 : 3 ○ D: 3 : 2

6. **Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that either Hafeez or Afridi would face the first ball?**

○ A: 2/11 ○ B: 1/11
○ C: 1/121 ○ D: 1/110

7. **There are 8 persons in the room. 4 are men and 4 are women. If two persons are selected, what is the probability that both of them would be men?**

○ A: ½ ○ B: 1/4
○ C: 3/7 ○ D: 3/14

8. **In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is?**

○ A: 21/46 ○ B: 25/117
○ C: 1/50 ○ D: 3/23

9. **Hafeez and Afridi are the members of 11 person squad of Pakistan cricket team. What is the probability that neither Hafeez nor Afridi would face the first ball?**

○ A: 2/11 ○ B: 1/11
○ C: 9/11 ○ D: 10/11

10. **An rack has 5 black and 4 white ties. A boy pulls out 2 ties at random. The probability that 2 are of the same colour is?**

○ A: 4/9 ○ B: 5/9
○ C: 5/8 ○ D: 3/8

11. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

○ A: 1/14
○ B: 1/8
○ C: ¾
○ D: 4/7

12. For any two events A and B, P(A ∩ B) is?

○ A: Less than P(A) + P(B) – 1
○ B: Greater than P(A) + P(B)
○ C: P(A) + P(B) - P(A ∪ B)
○ D: P(A) + P(B) + P(A ∪ B)

13. The probability that a man will live 10 more years is 1/4 and the probability that his wife will live 10 more years is 1/3. The probability that neither of them will be alive in 10 years is?

○ A: 1/12
○ B: 11/12
○ C: 7/12
○ D: 1/2

14. A box contains 2 white, 3 black and 4 red balls. The number of ways in which 3 balls can be drawn from the box, so that at least one of the balls is black is?

○ A: 45
○ B: 84
○ C: 64
○ D: 32

15. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

○ A: 10/21
○ B: 11/21
○ C: 2/7
○ D: 5/7

16. The chances of wining of two race horses are 1/3 and 1/6 respectively. What is the probability that atleast one will win, when the horses are running in different races?

○ A: ½
○ B: 1/8
○ C: 1/18
○ D: 4/9

17. How many signal can be made with 4 signs using any number of signs at a time?

○ A: 24
○ B: 60
○ C: 64
○ D: 82

18. How many words can be formed by taking four different letters of the word MATHEMATICS?

○ A: 7920
○ B: 1680
○ C: 1260
○ D: 68

19. $^{n}P_{r}$ = ?

○ A: $^{n}C_{r} * r!$
○ B: $^{n}C_{n-r} * r!$
○ C: $^{n}C_{n-r}$
○ D: Both A and B.

20. If the probability that a batsmen scores a century in any given match is 0.3. On average how many matches the batsmen would play to score his first century?

○ A: 2
○ B: 4
○ C: 15
○ D: 30

TEST 3

1. **A matrix is chosen at random from the set of all 2 x 2 matrices with elements 0 and 1 only. The probability that the value of the determinant of the matrix chosen is positive is?**

   ○ A: 1/8 ○ B: 3/16

   ○ C: 1/16 ○ D: 13/16

2. **Six identical coins are arranged in a row. The number of ways, in which the number of tails is equal to the number of heads is?**

   ○ A: 20 ○ B: 24

   ○ C: 36 ○ D: 48

3. **3 books of english and 5 books of urdu are randomly placed on a shelve. What is the probability that books on the same subject are together?**

   ○ A: 1/56 ○ B: 1/7

   ○ C: 2/8! ○ D: 1/28

4. **When a dice is rolled probability that even number or number greater than 4 appear is?**

   ○ A: 5/6 ○ B: 1/6

   ○ C: 2/3 ○ D: 1/3

5. **There are 10 lamps of different colors in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is?**

   ○ A: 1025 ○ B: 1024

   ○ C: 1023 ○ D: 10!

6. **Eight chairs are numbered 1 to 8. 2 women and 3 men wish to occupy one chair each. First, the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is?**

   ○ A: ${}^4C_3 \cdot {}^4C_2$ ○ B: ${}^4C_2 \cdot {}^4P_2$

   ○ C: ${}^4P_2 \cdot {}^4P_3$ ○ D: ${}^4P_2 \cdot {}^6P_3$

7. **Find the number of ways in which a mixed double tennis game can be arranged between 10 players consisting of 6 men and 4 women?**

   ○ A: 190 ○ B: 180

   ○ C: 90 ○ D: 48

8. **There are 18 children in the room including 9 boys and 9 girls. You call a child to give a sweet and the child goes back to the room and can potentially be chosen again. If total number of sweets are 4, what is the probability that atleast one boy gets the sweet?**

   ○ A: 1/16 ○ B: 15/16

   ○ C: 9/16 ○ D: 7/18

9. **If five digit numbers are formed from 1,2,3,4,8. What is the probability of forming a number with 2 and 8 not next to each other?**

   ○ A: 2/5 ○ B: 2/7

   ○ C: 5/7 ○ D: 3/5

10. **In how many ways 8 books including 2 English books can be arranged together such that English books are not together?**

   ○ A: 5040 ○ B: 10080

   ○ C: 30240 ○ D: 40320

A person wishes to make up as many different parties as he can out of his 20 friends, such that each party consists of the same number of persons. The number of friends he should invite at a time is?

○ A: 5 ○ B: 8

○ C: 10 ○ D: 12

11. Pakistan plays two matches each with West Indies and Australia. In any match, the probabilities of Pakistan getting points 0, 1 and 2 are 0.45, 0.05 and 0.50 respectively. Assuming that the outcomes are independent, the probability of Pakistan getting at least 7 points is?

○ A: 0.8750 ○ B: 0.0875

○ C: 0.0625 ○ D: 0.0250

12. In how many ways 5 boys and 4 girls can be seated in a bench such that boys and girls occupy alternate seats?

○ A: 1240 ○ B: 1560

○ C: 2590 ○ D: 2880

13. A man invites 4 men and 4 women to a party. In how many ways can they sit around a round table, so that no two men are together?

○ A: 6 ○ B: 24

○ C: 132 ○ D: 144

14. A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red is:?

○ A: 3/22 ○ B: 1/22

○ C: 2/91 ○ D: 3/91

15. Two different numbers a and b are chosen at random from the set of first 30 natural numbers. The probability that $a^2 - b^2$ is divisible by 3 is? Hint: $a^2 - b^2$ is divisible by 3 if both the numbers are divisible by 3 or none of them is divisible by 3.

○ A: 2/87 ○ B: 19/87

○ C: 37/87 ○ D: 47/87

16. $^{13}C_9 - ^{12}C_8$ is equal to?

○ A: $^{13}C_7$ ○ B: $^{13}C_9$

○ C: $^{12}C_9$ ○ D: None of the above.

17. The sides AB, BC, CA of a triangle ABC have 3, 4 and 5 points lying on them respectively. The number of triangles that can be constructed using these points as vertices is?

○ A: 205 ○ B: 208

○ C: 220 ○ D: 260

18. If A and B are two events, such that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\overline{B}) = 1/2$, then the events A and B are?

○ A: Independent ○ B: Dependent

○ C: Disjoint ○ D: None of the above.

19. How many necklaces can be made from 6 beads of different colors?

○ A: 60 ○ B: 120

○ C: 360 ○ D: 720

TEST 4

1. A carton contains 20 bulbs, out of which 5 are defective. If a sample of 3 bulbs is selected at random, find the probability that 2 of them are defective bulbs?

○ A: 1/16 ○ B: 3/64

○ C: 9/64 ○ D: 2/64

2. The number of ways in which 12 balls can be divided between two friends, one receiving 8 and the other 4 is?

○ A: 12! / 8!4! ○ B: 12!2! / 8!4!

○ C: 12! / 8!4!2! ○ D: 8!4!

3. The probability that A can solve a problem is 2/3 and the probability that B can solve the problem is 3/4. The probability that at least one of A and B will be able to solve the problem is?

○ A: 11/12 ○ B: 5/12

○ C: 1/12 ○ D: 1/2

4. Suppose a biased coin comes up heads with probability 0.3 when tossed. What is the probability of achieving 1 heads after six tosses?

○ A: 0.08 ○ B: 0.17

○ C: 0.30 ○ D: 0.44

5. How many 5 digit number divisible by 2 can be formed from 1,2,3,5,7?

○ A: 24 ○ B: 48

○ C: 124 ○ D: 132

6. Out of 40 consecutive integers, two are chosen at random. The probability that their sum is odd is?

○ A: 1/200 ○ B: 1/2

○ C: 20/39 ○ D: 1/20

7. Cards are drawn one by one at random from a well shuffled pack of 52 cards. What is the probability that there is only one ace in first 17 cards?

○ A: $({}^{4}C_{1} * {}^{48}C_{16}) / {}^{52}C_{17}$ ○ B: ${}^{48}C_{16} / {}^{52}C_{17}$

○ C: $({}^{4}C_{1} + {}^{48}C_{16}) / {}^{52}C_{17}$ ○ D: ${}^{4}C_{1} / {}^{52}C_{17}$

8. H.C.F of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: None of the above.

9. The number of arrangements which can be made using all the letters of the word LAUGH, if the vowels are adjacent is?

○ A: 120 ○ B: 24

○ C: 48 ○ D: 56

10. On the occasion of Eid festival, each student of a class sends greeting cards to others. If there are 20 students in the class, then the total number of greeting cards exchanged by the students is?

○ A: ${}^{20}C_{2}$ ○ B: $2 \times {}^{20}C_{2}$

○ C: $2\ {}^{20}P_{2} - 1$ ○ D: None of the above.

11. There are 4 letter boxes in a post office. In how many ways can a man post 8 different letters?

○ A: 4^{8} ○ B: 8^{4}

○ C: 8! ○ D: 4!

12. 5 men and 6 women have to be seated in a straight row, so that no two women are together. Find the number of ways in which this can be done?

○ A: 43200 ○ B: 39600

○ C: 36000 ○ D: 86400

13. The number of ways in which 5 beads of different colours can form a necklace is?

○ A: 6 ○ B: 12

○ C: 24 ○ D: 60

14. L.C.M. of n !, (n + 1) ! and (n + 2) ! is?

○ A: n! ○ B: (n+1)!

○ C: (n+2)! ○ D: n

15. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

○ A: ¾ ○ B: 1/3

○ C: 7/19 ○ D: 9/21

16. ${}^nP_n$ = ?

○ A: ${}^nC_n$ ○ B: ${}^{n+1}C_n$

○ C: n ○ D: n!

17. Everybody in a room shakes hand with every other person. The total number of hand shakes is 66. Find the total number of persons in the room?

○ A: 9 ○ B: 10

○ C: 11 ○ D: 12

18. A problem in statistics is given to three students A, B and C whose chances of solving it are 1/2, 1/3, 1/4 respectively. What is the probability that the problem will be solved?

○ A: ¼ ○ B: 1/24

○ C: 7/24 ○ D: 3/4

19. The number of ways in which a mixed double game can be arranged from among nine married couples, if no husband and wife play in the same game is?

○ A: 1512 ○ B: 756

○ C: 3024 ○ D: 3298

20. The number of ways in which p + q things can be divided into two groups, containing p and q things respectively is?

○ A: C(p + q, q) ○ B: P(p + q, p)

○ C: P(p + q, q) ○ D: C(p + q, p - q)

21. If you toss four coins, what is the probability of getting two heads and two tails?

○ A: 3/16 ○ B: 1/8

○ C: 2/8 ○ D: 3/8

22. When three dice are thrown, what is the probability of getting the same number on three of them?

○ A: 1/216 ○ B: 1/36

○ C: 5/36 ○ D: 1/6

23. The number of digits that can be formed from 2, 3, 5, 7, 8 with 2 and 8 next to each other is?

○ A: 24 ○ B: 36

○ C: 48 ○ D: 72

24. An employer wants to hire 3 analysts from 6 applicants and 2 designers from 4 applicants. What is the total number of ways in which she can make the selection?

○ A: 1490 ○ B: 132

○ C: 120 ○ D: 60

25. If ${}^{n}C_{r-1} = 36$, ${}^{n}C_{r} = 84$ and ${}^{n}C_{r+1} = 126$, then r is equal to?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

26. Four cars are racing in a circuit. What are the total number of permutations with which they can cross the finish line?

○ A: 4 ○ B: 16

○ C: 18 ○ D: 24

27. The probability that the 1st day of a random chosen month is a Friday is?

○ A: 1/7 ○ B: 1/12

○ C: 1/19 ○ D: 1/84

28. m parallel lines in a plane are intersected by a family of n parallel lines. The total number of parallelograms so formed is?

○ A: (m-1)(n-1) / 4 ○ B: mn/4

○ C: m(m-1)(n-1)/2 ○ D: mn(m-1)(n-1)/4

29. There are 10 girls and 20 boys in a class. 5 girls and 10 boys have blue eyes. Find the probability that one student chosen at random is a girl and has blue eyes?

○ A: 2/3 ○ B: 5/6

○ C: 1/6 ○ D: 1/2

30. If $P(A \cup B) \neq P(A) + P(B)$ Then;

○ A: A and B are disjoint sets. ○ B: A and B are Independent sets

○ C: A and B are overlapping sets ○ D: A and B are unit event sets.

31. From a set of 17 cards numbered 1 to 17, one card is drawn at random. The probability that the number is divisible by 3 or 7 is?

○ A: 2/17 ○ B: 5/17

○ C: 7/17 ○ D: 9/17

32. The number of times the digit 3 will appear listing the integers from 1 to 1000 is?

○ A: 271 ○ B: 280

○ C: 297 ○ D: 300

33. Three unbiased coins are tossed. What is the probability of getting atleast one head?

○ A: ¾ ○ B: 1/4

○ C: 1/8 ○ D: 7/8

Induction & Binomial Theorem

TEST 1

1. **Which of the following is not true regarding the binomial expansion of $(a + x)^n$?**
   - ○ A: Total number of terms is n + 1.
   - ○ B: Sum of exponents of a and x in each term of expansion is equal to n.
   - ○ C: Exponent of a decrease from n to n - 1.
   - ○ D: Exponent of x increase from 0 to n.

2. **What is the coefficient of the third term for $(x + y)^5$?**
   - ○ A: 2
   - ○ B: 5
   - ○ C: 8
   - ○ D: 10

3. **What is the general term of $(x + 2/x)^4$?**
   - ○ A: $C(4,k)\ 2^k\ x^{4-2k}$
   - ○ B: $C(4,k)\ 2^k\ x^{2-2k}$
   - ○ C: $C(4,k)\ 2^k\ x^{4-k}$
   - ○ D: $C(4,k)\ 2^{2k}\ x^{2-2k}$

4. **$(x+y)^4 = ?$**
   - ○ A: $x^4 + 2x^3y + 4x^2y^2 + 2xy^3 + y^4$
   - ○ B: $x^4 + 4x^3y + 6x^2y^2 + 2xy^3 + y^4$
   - ○ C: $x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$
   - ○ D: $x^4 + 4x^3y + 8x^2y^2 + 4xy^3 + y^4$

5. **If n is odd, the middle term in the expansion of $(a + x)^n$ is?**
   - ○ A: n/2 + 1
   - ○ B: n/2 and n/2 + 1
   - ○ C: (n + 1) / 2 and (n + 2) / 2
   - ○ D: (n + 1) / 2 and (n + 3) / 2

TEST 2

1. **The method of mathematical induction was devised by?**

   ○ A: David Hilbert ○ B: Francesco Mourolico
   ○ C: Issac Newton ○ D: Carl F. Gauss

2. **What is the 3rd term in the binomial expansion of**

3. $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^{6}$

   ○ A: -20 ○ B: 20
   ○ C: 15 a/x ○ D: 15 x/a

4. **Third term in the expansion of $(1 - x)^{-1}$ is?**

   ○ A: x^2 ○ B: $2x^2$
   ○ C: $-x^2$ ○ D: $-2x^2$

5. **Which of the following would have even number of terms in its expansion?**

   ○ A: $(a + x)^{20}$ ○ B: $(a + x)^{90}$
   ○ C: $(a + x)^{51}$ ○ D: Both A and B.

6. **What is the value of $(0.97)^6$ using only the first three terms of binomial expansion?**

   ○ A: 0.8246 ○ B: 0.8318
   ○ C: 0.8335 ○ D: 0.8452

7. **How many terms are there in the expansion of $(a + x)^{100}$**

   ○ A: 99 ○ B: 100
   ○ C: 101 ○ D: Cannot determine.

8. **What is the middle term in the expansion of $(4x – y)^8$?**

   ○ A: $19240\ x^4y^4$ ○ B: $17920\ x^4y^4$
   ○ C: $56220\ x^2y^2$ ○ D: $18420\ x^4y^4$

9. **What is the contant term in the expansion of $(1/z^3 + z^2)^5$?**

   ○ A: 10 ○ B: 16
   ○ C: 18 ○ D: 24

10. **What is the fourth term in the expansion of $(1 - x)^{1/2}$?**

    ○ A: - ¼ ○ B: - 1/2 x
    ○ C: $-1/8\ x^2$ ○ D: $- 1/16\ x^3$

TEST 3

1. For which x the 5th expansion member equals $M_5 = 105$?

$$\left(\frac{1}{2\sqrt{x}} - \frac{1}{2}\right)^{10}$$

○ A: ½ ○ B: 1/4

○ C: 1/8 ○ D: 2

2. If x is the sum of the odd coefficients and y is the sum of the even coefficients in a binomial expansion. Then?

○ A: $x = y/2$ ○ B: $x = y$

○ C: $x = 2y$ ○ D: None of the above.

3. The rule of binomial expansion for $(a + x)^n$ is valid if?

○ A: a and x both are real numbers. ○ B: a is real and x can be real or complex.

○ C: x is real and a can be real or complex. ○ D: Both a and x can be real or complex.

4. Find out the member of the binomial expansion of $(x + x^{-1})^8$ not containing x?

○ A: 7th ○ B: 6th

○ C: 5th ○ D: 4th

5. If in the expansion of $(x + y^3)^n$ the coefficient of the 3rd term is greater by 44 than the 2nd term. The value of n is?

○ A: 8 ○ B: 9

○ C: 10 ○ D: 11

6. Which term in the expansion of $(x - 2/x^2)^{13}$ has term x^{-2} ?

○ A: 5th ○ B: 6th

○ C: 7th ○ D: 8th

7. The sum of coefficients in the binomial expansion is equal to?

○ A: 2^n ○ B: 2^{2n}

○ C: 2^{2n-1} ○ D: 2^{n-1}

8. What is the middle term in the expansion of $(x + 1/x)^{2n}$? Where $x \neq 0$.

○ A: C(2n,n) ○ B: C(2n,n) x

○ C: C(2n,n) x^{2n} ○ D: C(2n,n) x^{3n}

9. What is the constant term in the expansion of $(x^2 - 2/x^2)^8$?

○ A: 1080 ○ B: 1120

○ C: 2400 ○ D: 2480

10. Which member of the binomial expansion of $(2x^3 + x^{-1})^{10}$contains x^6?

○ A: 6th ○ B: 7th

○ C: 8th ○ D: 9th

11. What is the term containing x^{14} in the expansion of $(x^3 - 1/x^2)^{13}$?

○ A: C(13,7) $12x^{14}$ ○ B: -C(13,6) $10x^{14}$

○ C: -C(13,5) x^{14} ○ D: C(13,8) $4x^{14}$

Trigonometry

TEST 1

1. **235° expressed in radians is?**

○ A: π / 235
○ B: 85π / 49
○ C: 47π / 36
○ D: 235/π

2. **1/2 rotation anti-clockwise is called?**

○ A: Right angle
○ B: Straight Angle
○ C: Circle
○ D: None of the above.

3. If $5\sin\theta = 3$, $\dfrac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to

○ A: ½
○ B: 1
○ C: 2
○ D: 4

4. **If $\cos 3\theta = \sqrt{3}/2$; $0 < \theta < 20^o$ then the value of θ is?**

○ A: 0°
○ B: 5°
○ C: 10°
○ D: 15°

5. **If sec θ - tan θ = 1/2 then sec θ + tan θ = ?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. **cos A - cos B = ?**

○ A: 2 cos (A+B)/2 cos (A-B)/2
○ B: 2 cos (A+B)/2 sin (A-B)/2
○ C: 2 sin (A+B)/2 cos (A-B)/2
○ D: -2 sin (A+B)/2 sin (A-B)/2

7. **Which of the following is not ture?**

○ A: cot (-θ) = - cot θ
○ B: cos (-θ) = cos θ
○ C: sin (-θ) = - sin θ
○ D: tan (-θ) = tan (θ)

8. **$\sin 30^0 + \cos 60^0 + \tan 45^0$ is equal to?**

○ A: 1
○ B: 2
○ C: 3
○ D: 4

9. **In sexagesimal system angle is represented in?**

○ A: Degrees
○ B: Degrees, Minutes and Seconds
○ C: Radians
○ D: Mircro radians.

10. **If sin θ = cos θ then θ = ?**

○ A: 30°
○ B: 45°
○ C: 60°
○ D: 75°

11. **If the length of arc is twice the radius of the circle. Then angle subtended at the center is?**

○ A: 1 radian
○ B: 2 radian
○ C: π/3 radian
○ D: π/4 radian

12. What is the period of tan 4x?

○ A: π ○ B: π/3
○ C: π/4 ○ D: π/8

13. $\tan^2 x - \sin^2 x$ is equal to?

○ A: $\tan^2 x \operatorname{cosec}^2 x$ ○ B: $\sin^2 x \cot^2 x$
○ C: $\sec^2 x \operatorname{cosec}^2 x$ ○ D: $\tan^2 x \sin^2 x$

14. $\tan 225^\circ$ =?

○ A: 0 ○ B: 1
○ C: √3 ○ D: 1/√3

15. tan (2π - θ) = ?

○ A: tan θ ○ B: - tan θ
○ C: cot θ ○ D: - cot θ

16. If cos A = 1/√2 and sin B = 1/2 then A+B = ?

○ A: 60° ○ B: 75°
○ C: 90° ○ D: 120°

17. 1° = ?

○ A: 0.0125 radian ○ B: 0.0175 radian
○ C: 0.0225 radian ○ D: 0.0275 radian

18. 35° 20' in radians is?

○ A: 28π / 220 ○ B: 53π / 45
○ C: 53π / 290 ○ D: 53π / 270

19. cos (π + θ) = ?

○ A: sin θ ○ B: - sin θ
○ C: cos θ ○ D: - cos θ

20. If A = B = 60°. Then $\frac{cscA + cotB}{secA * tanB}$ = ?

○ A: 0 ○ B: 1
○ C: ½ ○ D: 1/√2

TEST 2

1. Which of the following relations is possible?

○ A: sec θ = 2/3 ○ B: sin θ = 4/3
○ C: tan θ = 2014 ○ D: $\cos\theta = (1+t^2) / (1-t^2)$

2. sec (-960°) = ?

○ A: 2 ○ B: √2
○ C: -√2 ○ D: -2

3. cos 2α = ?

○ A: sin α cos α ○ B: 2 sin α cos α
○ C: $\cos^2 \alpha - \sin^2\alpha$ ○ D: $\cos^2 \alpha + \sin^2\alpha$

4. If α, β and γ are the angles of a triangle then sin (α + β) = ?

○ A: sin γ
○ B: cos γ
○ C: - sin γ
○ D: - cos γ

5. sin (-625°) = ?

○ A: sin 5°
○ B: cos 5°
○ C: sin 15°
○ D: cos 15°

6. Converting 21.256° to DMS gives?

○ A: 21° 15.36'
○ B: 21° 18' 32"
○ C: 21° 15' 22"
○ D: 21° 15' 28"

7. If sin (A + B + C) = 1, tan (A - B) = 1/√3, and sec(A + C) = 2, then?

○ A: A = 120°, B = 60° and C = 0°
○ B: A = 60°, B = 30° and C = 0°
○ C: A = 60°, B = 60° and C = 60°
○ D: A = 90°, B = 60° and C = 30°

8. sin A + sin B = ?

○ A: -2 sin (A+B)/2 sin (A-B)/2
○ B: 2 cos (A+B)/2 cos (A-B)/2
○ C: 2 sin (A+B)/2 cos (A-B)/2
○ D: 2 cos (A+B)/2 sin (A-B)/2

9. The value of tan 15° + cot 15° is ?

○ A: 1
○ B: √3
○ C: √3/2
○ D: 4

10. The period of the function f(x) =cos 4x is?

○ A: π
○ B: 2π
○ C: π/2
○ D: 3π/2

11. If $x = \sin^2 \theta \cos \theta$ and $y = \cos^2 \theta \sin \theta$ then $\sin \theta$ = ?

○ A: x^2 / y
○ B: y^2 / x
○ C: $(y^2 / x)^{1/3}$
○ D: $(x^2 / y)^{1/3}$

12. What is the period of cot x/7 ?

○ A: 7π
○ B: 2π/7
○ C: π/7
○ D: π/14

13. If cot θ = sin 2θ, then θ is equal to?

○ A: 45° and 90°
○ B: 45° and 90°
○ C: 90° and 60°
○ D: 60° and 30°

14. The value of $\cos^2 15° - \cos^2 30° + \cos^2 45° - \cos^2 60° + \cos^2 75°$ is?

○ A: 1
○ B: 1/2
○ C: 3/2
○ D: 2

15. If tan θ = 8/15 then what is the value of sec θ for θ lying in the quadrant III?

○ A: 15/17
○ B: -15/17
○ C: 17/15
○ D: - 17/15

16. The largest value of sinθ x cosθ is?

○ A: 1
○ B: 1/2
○ C: 1/√2
○ D: 1/√3

17. $(1 + \sec\theta)(1 - \cos\theta) = ?$

○ A: $\sin\theta$
○ B: $\cot\theta$
○ C: $\cot\theta \cos\theta$
○ D: $\tan\theta \sin\theta$

18. $\sec(-7\pi/4) = ?$

○ A: $\sqrt{2}$
○ B: $-\sqrt{2}$
○ C: $2/\sqrt{3}$
○ D: $-2/\sqrt{3}$

19. If the length of a chord of a circle is equal to the radius of that circle, the angle subtended (in radians) at the centre of the circle by the chord is?

○ A: 1
○ B: $\pi/2$
○ C: $\pi/3$
○ D: $\pi/6$

20. The value of $\cos 1° * \cos 2° * \cos 3° \ldots\ldots \cos 179°$ is ?

○ A: 0
○ B: 1
○ C: 2
○ D: -1

TEST 3

1. The perimeter of a certain sector of a circle is equal to half that of the circle of which it is a part. The circular measure of the angle of the sector is?

○ A: π
○ B: $\pi - 2$
○ C: $2\pi/3$
○ D: $\pi - 4$

2. $\tan 3x - \tan 2x - \tan x$ is equal to?

○ A: $\tan x / (\tan 2x * \tan 3x)$
○ B: $(\tan x)^3$
○ C: $(\tan 3x + \tan 2x + \tan x) - (\tan x * \tan 2x)$
○ D: $\tan x * \tan 2x * \tan 3x$

3. $\sin 75^o = ?$

○ A: $\dfrac{\sqrt{2}(\sqrt{3}+1)}{4}$
○ B: $\dfrac{\sqrt{2}(\sqrt{3}-1)}{4}$
○ C: $\sqrt{3}/4$
○ D: $-\sqrt{3}/4$

4. The equation $\sin x \cos x = 2$ has?

○ A: One solution
○ B: Two solutions
○ C: Infinite solutions.
○ D: No solution.

5. $\cos(x+y)\sin(x-y) = ?$

○ A: $1/2 (\sin 2x - \sin 2y)$
○ B: $1/2 (\sin 2y - \sin 2x)$
○ C: $\sin 2x - \sin 2y$
○ D: $\sin 2x + \sin 2y$

6. $\tan(294^o) = ?$

○ A: $\cot 32^o$
○ B: $-\cot 32^o$
○ C: $-\cot 24^o$
○ D: $\cot 24^o$

7. If $\sin A + \sin B = x$ and $\cos A + \cos B = y$, $\cos(A - B)$ is equal to ?

○ A: $x^2 + y^2 - 2$
○ B: $(x^2 + y^2 - 2) / 2$
○ C: $(2 - x^2 + y^2) / 2$
○ D: $(2 - x^2 - y^2) / 2$

8. Period of cot (3x) - sin (4x) is?

○ A: πq ○ B: π/2
○ C: π/3 ○ D: π/4

9. $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = ?$

○ A: 1 ○ B: 2
○ C: tan 2θ ○ D: cot 2θ

10. (1 - cos α) / sin α = ?

○ A: cos α/2 ○ B: sin α/2
○ C: sec α/2 ○ D: tan α/2

11. 8 sin x/8 cos x/2 cos x/4 cos x/8 = ?

○ A: 4 sin x ○ B: sin x
○ C: cos x ○ D: 8 cos x

12. What is the domain of $\sqrt{sin^{-1}2x + \pi/6}$?

○ A: [1/4 , 1/2] ○ B: [-1/4 , 1/2]
○ C: [1/8 , 1/2] ○ D: [-1/8 , 1/2]

13. cos 12° + cos 48° = ?

○ A: 2 cos 30° cos 18° ○ B: - 2 cos 30° cos 18°
○ C: 2 cos 30° sin 18° ○ D: - 2 cos 30° sin 18°

14. If (x sin^3 α + y cos^3 α) = sin α cos α and
(x sin α - y cos α = 0), then $x^2 + y^2$ = ?

○ A: 0 ○ B: 2
○ C: -1 ○ D: 1

15. If sin^{2}θ + 3 cosθ - 2 = 0, cos^{3}θ + sec^{3}θ is equal to?

○ A: 18 ○ B: 9
○ C: 6 ○ D: 3

16. The value of tan 1° * tan 2° * tan 3° ...... tan 89° = ?

○ A: 0 ○ B: 1
○ C: -1 ○ D: 1/2

17. If cos (A - B) = 3/5 and tan A . tan B = 2 then ?

○ A: cos A cos B = 1/5 ○ B: sin A sin B = -2/5
○ C: cos (A + B) = 1/5 ○ D: sin A sin B =4/5

18. sin 2α / (1 + cos 2α) = ?

○ A: cot α ○ B: tan α
○ C: sec α ○ D: csc α

19. Find the value of $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta}$

○ A: tan 3θ ○ B: cot 3θ
○ C: tan 6θ ○ D: cot 6θ

20. $\dfrac{\tan\alpha + \tan\beta}{\tan\alpha - \tan\beta} = ?$

○ A: sin (α + β) / sin (α - β)
○ B: sin (α - β) / sin (α + β)
○ C: cot (α + β)
○ D: sin α / sin (α - β)

TEST 4

1. tan (15°) = ?

○ A: (√3 + 1) / (√3 - 1)
○ B: (√3 - 1) / (√3 + 1)
○ C: √3 / (√3 + 1)
○ D: 1/3√3

2. The bottom of a pendulum describes an arc 3 ft long when the pendulum swings through an angle of 1/5 radian. The length of the pendulum in feet is ?

○ A: 15 ft
○ B: 12 ft
○ C: 5/3 ft
○ D: 3/5 ft

3. tan (π/4 + θ) tan (3π/4 + θ) is equal to ?

○ A: 0
○ B: 1
○ C: -1
○ D: 2

4. If tan 2 A = cot (A - 18°), then the value of A is?

○ A: 18°
○ B: 24°
○ C: 27°
○ D: 36°

5. What is the period of sec 9x ?

○ A: π
○ B: 2π/9
○ C: π/9
○ D: π/18

6. If cot θ > 0 and sin θ < 0 then θ lies in the ?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

7. If α, β and γ are the angles of a triangle then tan (α + β) - tan γ = ?

○ A: 2 tan γ
○ B: - 2 tan γ
○ C: 0
○ D: 1

8. 1 radian = ?

○ A: 60°
○ B: 59°
○ C: 58°
○ D: 57°

9. 6'' in radians = ?

○ A: π / 216000 radians
○ B: π / 108000 radians
○ C: π / 648000 radians
○ D: π / 3600 radians

10. The radius of a circle is 8 in. Find the angle in radians that an arc of 1 ft subtends in the center of this circle?

○ A: 1/8
○ B: 2/8
○ C: 3/2
○ D: π/6

11. In a triangle ABC, A = 45°, then the value of (1 + cot B) (1 + cot C) is equal to ?

○ A: 0
○ B: 1
○ C: -1
○ D: 2

12. If $\tan \theta = -4/3$, $\sin \theta$ = ?

○ A: -4/5 but not 4/5
○ B: 4/5 but not -4/5
○ C: 4/5 or - 4/5
○ D: Undefined.

13. Which of the following is true for $0^o \le \theta < 90^o$?

○ A: $1/\sec \theta > 1$
○ B: $1/\text{cosec}\ \theta < 1$
○ C: $\sec \theta = 0$
○ D: $1/\cos \theta < 1$

14. Which of the following is true about θ in the quadrant II?

csc θ is positive, cos θ is positive, tan θ is positive

○ A: i only
○ B: i and ii only
○ C: ii and iii only
○ D: None of them is true

15. Domain of csc θ is θ Є R except θ = ?

○ A: nπ where n Є Z
○ B: [(2n+1)/2] π where n Є Z
○ C: nπ/2 where n Є Z
○ D: (2n+1/2)π where n Є Z

16. If $\sec \theta + \tan \theta = x$ then $\tan \theta$ = ?

○ A: $(x^2 - 1) / x$
○ B: $(x^2 + 1) / x$
○ C: $(x^2 + 1) / 2x$
○ D: $(x^2 - 1) / 2x$

17. Which of the following is not possible?

○ A: $\sin \theta = 3/4$
○ B: $\tan \theta = 75$
○ C: $\text{cosec}\ \theta = 5/3$
○ D: $\cos \theta = (1 + t^2) / (1 - t^2)$

18. The value of $\sin^2 \pi/8 + \sin^2 3\pi/8 + \sin^2 5\pi/8 + \sin^2 7\pi/8$ is?

○ A: -1
○ B: 0
○ C: 1
○ D: 2

19. If tan A = 1/2, then tan 2A is equal to?

○ A: 1
○ B: 1/2
○ C: 4/3
○ D: 5/4

20. If $A = B = C = 60^o$ then $\dfrac{tanA + tanB + tanC}{tanA * tanB * tanC}$ = ?

○ A: 0
○ B: 1
○ C: -1
○ D: √3

Inverse Trigonometric Function

TEST 1

1. **Which of the following is true?**

$\sin^{-1} x = (\sin x)^{-1},\quad \cos^{-1} x = (\cos x)^{-1},\quad \tan^{-1} x = (\cot x)^{-1}$

○ A: i and ii only ○ B: ii only
○ C: i, ii and iii ○ D: None of them is true.

2. **$\cos^{-1} A + \cos^{-1} B = ?$**

○ A: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ D: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$

3. **Principal value of $\sin^{-1}(-\sqrt{3}/2) = ?$**

○ A: $-2\pi/3$ ○ B: $-\pi/3$
○ C: $\pi/3$ ○ D: $2\pi/3$

4. **Range of $y = \sin^{-1} x$ is?**

○ A: $-\pi/2 \le y \le \pi/2$ ○ B: $-\pi \le y \le \pi$
○ C: $-\pi/4 \le y \le \pi/4$ ○ D: $-1 \le y \le 1$

The value of $\tan^{-1}(-1/\sqrt{3})$ is?

○ A: $\pi/3$ ○ B: $-\pi/4$
○ C: $3\pi/4$ ○ D: $-\pi/6$

5. **What is the value of $\tan^{-1} 3/4 + \tan^{-1} 5/12$?**

○ A: $\tan^{-1} 56/33$ ○ B: $\tan^{-1} 16/33$
○ C: $\tan^{-1} 15/48$ ○ D: $\tan^{-1} 16/63$

6. **$y = \tan x$ is called principal tangent function if ?**

○ A: - infinity < x < infinity ○ B: $-\pi < x < \pi$
○ C: $-\pi/2 < x < \pi/2$ ○ D: $0 < x < \pi$

7. **$\cos^{-1}(-1/2) = ?$**

○ A: $\pi/3$ ○ B: $-2\pi/3$
○ C: $2\pi/3$ ○ D: Both B and C.

8. **Range of $y = \cos^{-1} x$ is?**

○ A: $-\pi/2 \le y \le \pi/2$ ○ B: $-\pi \le y \le \pi$
○ C: $0 \le y \le \pi/2$ ○ D: $0 \le y \le \pi$

9. **$2\tan^{-1} A = ?$**

○ A: $\tan^{-1} 2A / (1 + A^2)$ ○ B: $\tan^{-1} 2A / (1 - A^2)$
○ C: $\tan^{-1} A / (1 + A^2)$ ○ D: $\tan^{-1} A / (1 - A^2)$

10. **$\cos(\cos^{-1} 1/5) = ?$**

○ A: 1 ○ B: 5
○ C: 1/5 ○ D: 4/5

11. $\cos(\sin^{-1} 1/\sqrt{2}) = ?$

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}/3$
○ C: $2/\sqrt{3}$
○ D: $1/2$

12. $\cos^{-1} A - \cos^{-1} B = ?$

○ A: $cos^{-1}(AB - \sqrt{(1-A^2)(1-B^2)})$
○ B: $cos^{-1}(AB + \sqrt{(1-A^2)(1-B^2)})$
○ C: $cos^{-1}(AB + \sqrt{(1+A^2)(1+B^2)})$
○ D: $cos^{-1}(AB - \sqrt{(1+A^2)(1+B^2)})$

13. Which of the following function has domain ranging from - infinity to + infinity ?

○ A: $y = \sin^{-1} x$
○ B: $y = \sec^{-1} x$
○ C: $y = \cos^{-1} x$
○ D: $y = \tan^{-1} x$

TEST 2

1. The value of sec $\left[\tan^{-1}\left(\frac{b+a}{b-a}\right) - \tan^{-1}\left(\frac{a}{b}\right)\right]$ is

○ A: $\sqrt{3}/2$
○ B: $\sqrt{2}$
○ C: 1
○ D: $1/\sqrt{3}$

2. If $y = \sin^{-1} x$ then $\cos(\sin^{-1} x) = ?$

○ A: $(1-x)^{1/2}$
○ B: $(1-x)^{1/2}$
○ C: $(1-x^2)^{1/2}$
○ D: $(1+x^2)^{1/2}$

3. $\cos[\tan^{-1} 1/3 + \tan^{-1} 1/2] = ?$

○ A: $1/\sqrt{2}$
○ B: $\sqrt{2}$
○ C: $\sqrt{3}/2$
○ D: $1/2$

4. $\cot^{-1}(-1) = ?$

○ A: 1
○ B: $\pi/2$
○ C: $2\pi/3$
○ D: $3\pi/4$

5. Principal value of $\sin^{-1}(\sin 3\pi/5) = ?$

○ A: $3\pi/5$
○ B: $4\pi/5$
○ C: $2\pi/5$
○ D: $\pi/5$

6. What is the principal value of $\cot^{-1}(-1/\sqrt{3})$?

○ A: $3\pi/2$
○ B: $\pi/3$
○ C: $\pi/6$
○ D: $2\pi/3$

7. $\sin^{-1} 3/5 + \sin^{-1} 8/17 = ?$

○ A: $\sin^{-1}(11 / 23)$
○ B: $\sin^{-1}(19 / 76)$
○ C: $\sin^{-1}(63 / 95)$
○ D: $\sin^{-1}(77 / 85)$

8. Which of the following is Domain and Range of $y = \cot^{-1} x$?

○ A: Domain: $-\infty < x < \infty$ Range: $-\pi/2 < y < \pi/2$
○ B: Domain: $-1 < x < 1$ Range: $-\pi/2 < y < \pi/2$
○ C: Domain: $-\infty < x < \infty$ Range: $-\pi < y < \pi$
○ D: Domain: $-\infty < x < \infty$ Range: $0 < y < \pi$

9. Principal value of $\sin^{-1}$ [sin (2π/3)] = ?

○ A: 2π/3
○ B: -2π/3
○ C: π/3
○ D: π/6

10. cos ($\sin^{-1}$ 3/5) = ?

○ A: 3/5
○ B: 1/3
○ C: 4/5
○ D: 2/√3

11. Range of y = $\tan^{-1}$ x is ?

○ A: - π/2 < y < π/2
○ B: - π/2 ≤ y ≤ π/2
○ C: 0 ≤ y ≤ 2π
○ D: 0 < y < 2π

12. $tan^{-1}\dfrac{a-b}{1+ab}+tan^{-1}\dfrac{b-c}{1+bc}=?$

○ A: $\tan^{-1}$ a - $\tan^{-1}$ c
○ B: $\tan^{-1}$ a - $\tan^{-1}$ b
○ C: $\tan^{-1}$ b - $\tan^{-1}$ c
○ D: $\tan^{-1}$ c - $\tan^{-1}$ a

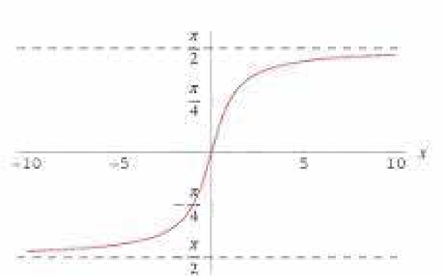
13. If α = 2$\cos^{-1}$ 4/5 then sin α = ?

○ A: 3/5
○ B: 24/25
○ C: 4/5
○ D: 30/25

14. $sin^{-1}(2x\sqrt{1-x^2})=?$

○ A: $\sin^{-1}$ x
○ B: 2 $\sin^{-1}$ x
○ C: 3 $\sin^{-1}$ x
○ D: 4 $\sin^{-1}$ x

15. The graph below is for which function?



○ A: y = $\sin^{-1}$ x
○ B: y = $\cos^{-1}$ x
○ C: y = $\tan^{-1}$ x
○ D: y = $\cot^{-1}$ x

16. If $\tan^{-1}$ (1 + x) + $\tan^{1}$ (1 − x) = π/2 then x = ?

○ A: 0
○ B: 1
○ C: -1
○ D: √3

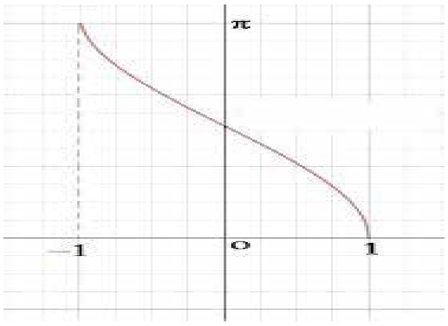
17. y = sec x is called a principal secant function if?

○ A: -π ≤ x ≤ π and x ≠ π/2 or - π/2
○ B: -π/2 < x < π/2
○ C: 0 ≤ x ≤ π and x ≠ π/2
○ D: 0 ≤ x < π/2

18. If α = $\sin^{-1}$ 5/13 , then cos α = ?

○ A: 8/13
○ B: 7/13
○ C: 11/13
○ D: 12/13

19. The graph below is for which function?



○ A: $\sin^{-1} x$

○ B: $\cos^{-1} x$

○ C: $\tan^{-1} x$

○ D: $\cot^{-1} x$

20. $\mathrm{cosec}^{-1} (-2/\sqrt{3}) = ?$

○ A: $\pi/3$

○ B: $-\pi/3$

○ C: $4\pi/3$

○ D: $-4\pi/3$

TEST 3

1. $\sin (\sin^{-1} 1/5 + \cos^{-1} x) = 1$ then $x = ?$

○ A: 2/5

○ B: 1/3

○ C: 1/5

○ D: 1/2

2. $\sin (2\cos^{-1} x) = ?$

○ A: $2x\sqrt{1-x^2}$

○ B: $2x\sqrt{1-x}$

○ C: $\dfrac{2x}{\sqrt{1-x^2}}$

○ D: $\dfrac{2x}{\sqrt{1+x^2}}$

3. Domain and range of $y = \csc^{-1} x$ is ?

○ A: Domain : $-\infty < x < \infty$ Range : $-\pi/2 \le y \le \pi/2$

○ B: Domain : $-1 \le x \le 1$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ C: Domain : $1 \le |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

○ D: Domain : $1 > |x|$ Range : $-\pi/2 \le y \le \pi/2$ and $y \ne 0$

4. $\sin (\cos^{-1} -2/3) = ?$

○ A: $1/\sqrt{2}$

○ B: $\sqrt{5}/3$

○ C: $1/\sqrt{3}$

○ D: $\sqrt{3}$

5. If $\tan^{-1} 2x + \tan^{-1} 3x = \pi/4$, what is the value of x?

○ A: 1/6

○ B: -1

○ C: -1 and 1/6

○ D: 1

6. $\cos^{-1} (\cos 7\pi/6) = ?$

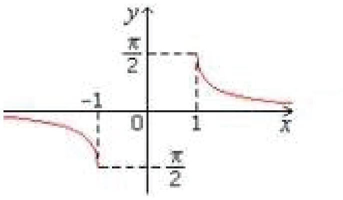
○ A: $7\pi/6$

○ B: $\pi/6$

○ C: $5\pi/6$

○ D: $\pi/3$

7. **The graph below is for which function?**



○ A: $y = \tan^{-1} x$

○ B: $y = \cot^{-1} x$

○ C: $y = \sec^{-1} x$

○ D: $y = \csc^{-1} x$

8. **If $\sin^{-1} x + \sin^{-1} y = 2\pi/3$, then $\cos^{-1} x + \cos^{-1} y$ is equal to ?**

○ A: $2\pi/3$

○ B: $3\pi/2$

○ C: $\pi/5$

○ D: $\pi/3$

9. **$\tan^{-1} (-x) = ?$**

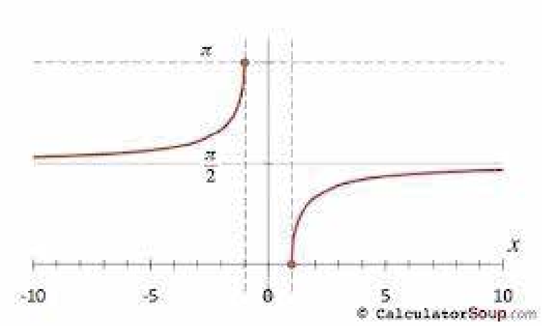
○ A: $\tan^{-1} (x)$

○ B: $- \tan^{-1} (x)$

○ C: $- \cot^{-1} (x)$

○ D: $\cot^{-1} (x)$

10. **The graph below is for which function?**



○ A: $y = \tan^{-1} x$

○ B: $y = \cot^{-1} x$

○ C: $y = \csc^{-1} x$

○ D: $y = \sec^{-1} x$

11. **$\tan (\sin^{-1} x) = ?$**

○ A: $x / (1-x^2)$

○ B: $x / (1-x)$

○ C: $\frac{x}{\sqrt{1+x^2}}$

○ D: $\frac{x}{\sqrt{1-x^2}}$

12. $\sin\left[\frac{\pi}{2} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right] =$

○ A: $\sqrt{3}/2$

○ B: $-\sqrt{3}/2$

○ C: ½

○ D: - 1/2

13. **The value of $\tan (\cos^{-1}(4/5) + \tan^{-1} (2/3))$ is equal to ?**

○ A: 7/5

○ B: 17/6

○ C: 17/18

○ D: Cannot be determined.

14. **The value of $\tan^{-1}1 + \tan^{-1} 2 + \tan^{-1} 3$ is ?**

○ A: $\pi/2$

○ B: -1

○ C: 1

○ D: 0

15. tan ($\sin^{-1}$ -3/4) = ?

○ A: $3/\sqrt{5}$ ○ B: $-3/\sqrt{5}$

○ C: $3/\sqrt{7}$ ○ D: $-3/\sqrt{7}$

16. Value of cos ($\tan^{-1}$ 15/8 - $\sin^{-1}$ 7/25) = ?

○ A: 114/350 ○ B: 297/425

○ C: 215/345 ○ D: 138/147

17. The product of the roots of the equation $\tan^{-1}(2x) + \tan^{-1}(3x) = 3\pi/4$ is ?

○ A: -1/6 ○ B: -1/2

○ C: 1 ○ D: 3

Function And Limits

TEST 1

1. If f(x,y,z)=2x+3y-z and f(a,b,0)=f(0,a,b), then b / a equals

○ A: 0 ○ B: 2

○ C: ½ ○ D: 1/4

2. Range of the function $f(x) = \sqrt{36 - x^2}$ **is**

○ A: $[0, -\infty]$ ○ B: $[\infty, -\infty]$

○ C: $[0, 6]$ ○ D: $[36, 1]$

3. If $f(x) = 3x^2 - 2x + 4$, f(-2) =

○ A: -2 ○ B: 20

○ C: 4 ○ D: 12

4. If $g(x) = x^3 - x^2 - x - 1$, then the value of g(-1) is:

○ A: 0 ○ B: 1

○ C: -2 ○ D: 2

5. Let $f(x) = 3x^2 + 4$, g(x) = 2 and h={(1,2),(2,1),(3,2)}.

○ A: f(x) is the only function. ○ B: f(x) and g(x) are the only functions.

○ C: f(x), g(x) and h(x) are all functions.

○ D: None of these are functions.

6. If f(x)=3 and g(x)=2, then f(g(x))=

○ A: 2 ○ B: 3

○ C: 6 ○ D: 5

7. Range of the function $f(x) = 2x - 3$ **is**

○ A: $(-\infty, +\infty)$ ○ B: [2,3]

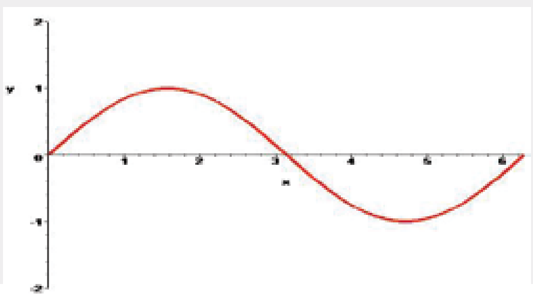
○ C: [2,10] ○ D: None of the above.

8. If f(x)=2x+3 and g(x) = x^2 - 1, then f(g(2))=

○ A: 4 ○ B: 9

○ C: 13 ○ D: 19

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If p(x)=4x-6 and p(a)=0, then a=

○ A: 3 ○ B: 2

○ C: 3/2 ○ D: 2/3

11. If f(x)=x and g(x)=x.f(x), then f(x) / g(x) =

○ A: x ○ B: 1/x

○ C: 1 ○ D: None of the above.

12. If $f(x) = x^7 - 97x^6 - 199x^5 + 99x^4 + 2x + 195$, $f(-1)$ equals:

○ A: 24 ○ B: 154

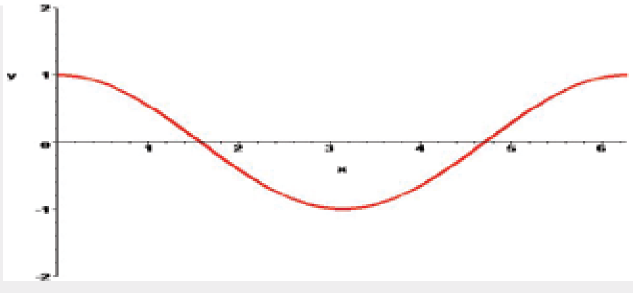
○ C: 272 ○ D: 393

13. What value(s) must be excluded for the domain of f={(x,y):y=$\frac{x+2}{x-2}$}?

○ A: 2 ○ B: -2

○ C: 0 ○ D: 2 and -2

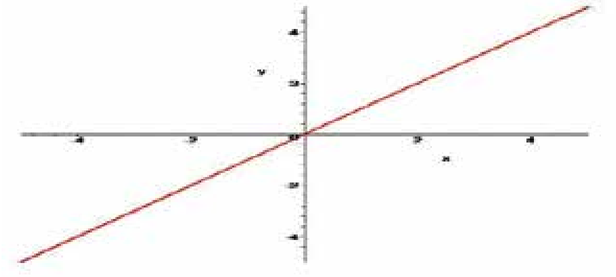
14. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the Above

16. If f(1) = 1 and f(2) = 2 and f(-1) = -1, then f(x) would be:

○ A: 0 ○ B: 1

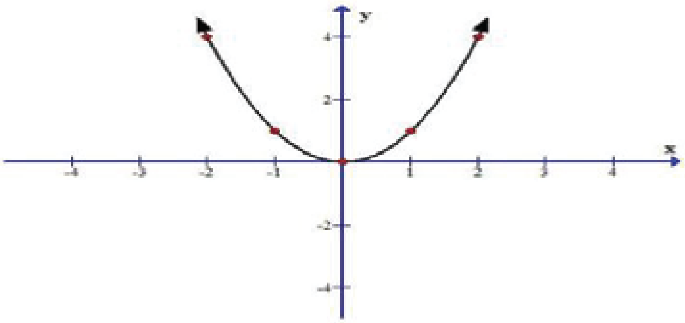
○ C: 2 ○ D: x

17. If $f(r,\theta) = r\cos\theta,\ f(2,\frac{\pi}{3}) =$

○ A: 2π ○ B: 1

○ C: $\frac{\pi}{6}$ ○ D: $\frac{1}{2}$

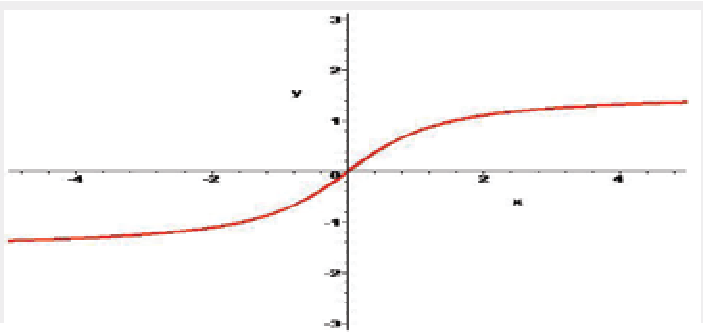
18. Which of the following functions represents the plot shown?



○ A: $f(x) = x^2$ ○ B: $f(x) = x^2 - x - 5$

○ C: $f(x) = x^3$ ○ D: None of the above.

19. The following figure shows a graph of which type of function?



○ A: Cosecant ○ B: Secant

○ C: Cotangent ○ D: Arctangent

20. If $f(x, y, z) = x^2 + y^2 - 2z$ **for all real numbers x, y and z, then f(-1,-1,-1)=**

○ A: 0 ○ B: 2

○ C: 4 ○ D: 6

TEST 2

1. If f(x,y)=3x+2y-8 and g(z) = z^2 for all real numbers x,y,z then f(3,g(4))=

○ A: 15
○ B: 33
○ C: 45
○ D: 25

2. For a function to be even as well as odd, it must be:

○ A: Symmetric about origin (by 180^0)
○ B: Symmetric about y-axis (by 180^0)
○ C: Both A and B
○ D: None of the above

3. If g(x)=3 and $f(x) = \dfrac{1}{3x+2}$, then f(g(3))=

○ A: 1/11
○ B: 1/17
○ C: 3/5
○ D: 9/11

4. Which statement is correct for the following functions?

$$f(x) = \frac{2}{7}x^2, \qquad g(x) = -x^3$$

○ A: Both I and II are even.
○ B: Both I and II are odd.
○ C: I is even and II is odd.
○ D: I is odd and II is even.

5. If f(x) = x+3 and g(x) = x^2 , for what value of does f(g(x))=g(f(x))

○ A: 1
○ B: 0
○ C: -1
○ D: 2

6. Which of the following relations are said to be odd?

$y=x^2 + 1$, $y=\sin(x)$, $y = x^3 - x + 1$

○ A: Only II.
○ B: Only I & II.
○ C: Only I & III.
○ D: Only II & III.

7. Find the inverse of $g(x) = \dfrac{2x}{x-1}$

○ A: $g^{-1}(y) = \dfrac{y+5}{y-2}$
○ B: $g^{-1}(y) = \dfrac{y}{y-2}$
○ C: $g^{-1}(y) = \dfrac{y-7}{y}$
○ D: $g^{-1}(y) = \dfrac{y+4}{y-2}$

8. If f(x) = $x^2 + 3x - 4$ and g(x)=x-4, then f(g(x))=

○ A: $2x^2 - 3x + 2$
○ B: $2x^2 - 3x$
○ C: $x^2 - 5x + 10$
○ D: $x^2 - 5x$

9. Find $\lim\limits_{x\to 1} \dfrac{\sqrt{x}-1}{x-1}$

○ A: ¼
○ B: 1/2
○ C: 1
○ D: 2

10. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is correct:

○ A: If $f(x) \geq 0$, then $\lim_{x\to a} f(x) \geq 0$

○ B: If $f(x) \geq g(x)$, then $\lim_{x\to a} f(x) \geq \lim_{x\to a} g(x)$

○ C: If $f(x) \geq 0$, then $\lim_{x\to a} \sqrt{f(x)} = \sqrt{\lim_{x\to a} f(x)}$

○ D: All are correct.

11. If {(3,2),(4,2),(3,1),(7,1),(2,3)} is to be a function, which of the following must be removed from the set?

○ A: (3,2)
○ B: (4,2)
○ C: (2,3)
○ D: None of the above.

12. To show a function is discontinuous, we can do one of three things:

Show that the function fails the sequence definition,

Show that the function fails the ε -> δ definition

Prove by contradiction by relating it to a function known to be discontinuous

○ A: Only (i) is correct.
○ B: Only (i) and (iii) are correct.
○ C: None of these are correct.
○ D: (i), (ii) and (iii) are correct.

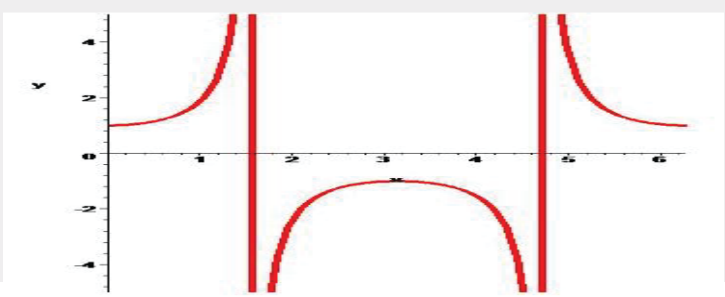
13. If f(x,y)=x+y and g(x,y)=x-y, then f(g(2,1),f(2,-1)) equals:

○ A: 0
○ B: 1
○ C: 2
○ D: 4

14. Range of the function f(x)= sin (x) is

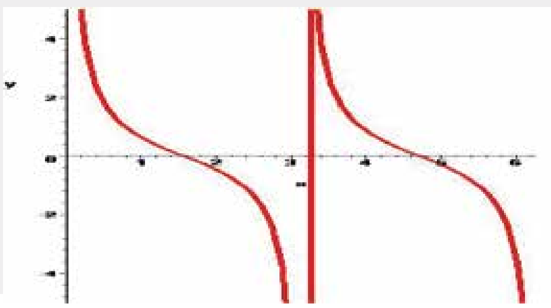
○ A: [-1,1]
○ B: $[-\frac{\pi}{2}, \frac{\pi}{2}]$
○ C: [0,1]
○ D: None of the above.

15. The following figure shows a graph of which type of function?



○ A: Tangent
○ B: Secant
○ C: Cosecant
○ D: Cosine

16. The following figure shows a graph of which type of function?



○ A: Cotangent
○ B: Arctangent
○ C: Cosecant
○ D: Tangent

17. $f(x)=\cos x$, $g(x)=\sin x$, $h(x) = \pm\sqrt{x}$

○ A: f(x) is the only function.

○ B: g(x) is the only function.

○ C: f(x) and g(x) are the only function.

○ D: All three are functions.

18. Assuming that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, which of the following is not true:

○ A: $\lim_{x\to a}(f(x) \pm g(x)) = \lim_{x\to a} f(x) \pm \lim_{x\to a} g(x)$

○ B: $\lim_{x\to a}(f(x)g(x)) = (\lim_{x\to a} f(x))(\lim_{x\to a} g(x))$

○ C: $\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$

○ D: $\lim_{x\to a} |f(x)| = -\left|\lim_{x\to a} f(x)\right|$

19. If $f(x, y) = 2x^2 - y^2$ and $g(x) = 2^x$, which of the following equal 2^{2x} ?

○ A: f(x,g(x))

○ B: f(g(x),x)

○ C: f(g(x),g(x))

○ D: f(g(x),0)

20. If $f(x) = 4x + 2$ for all x, then for x=0.5 $f^{-1}(x) =$?

○ A: 4

○ B: $\frac{1}{16}$

○ C: $\frac{1}{4}$

○ D: $-\frac{3}{8}$

TEST 3

1. If $g(x-1)= x^2 + 2$, then g(x)=

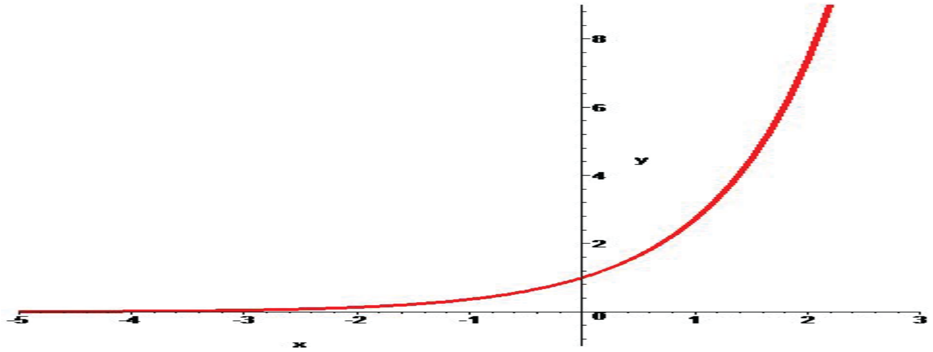
○ A: $x^2 - 2x + 3$

○ B: $x^2 + 2x + 3$

○ C: $x^2 - 2x + 6$

○ D: $x^2 - 2x$

2. The following figure shows graph of which type of function?



○ A: Log Function

○ B: Exponential Growth

○ C: Exponential Decay

○ D: None of the above.

3. If $f(x) = 3x - 5$ and $g(y) = y^2 - 1$, then f(g(z)) equals

○ A: $(3z - 5)^2 - 1$ ○ B: $3z^2 - 8$

○ C: $3z^3 - 5z^2 - 3z + 8$ ○ D: $x^2 + 3z - 8$

4. $\lim\limits_{x \to 0} \dfrac{\cos(2x) - 1}{\cos x - 1}$ **= ?**

○ A: 2 ○ B: 4

○ C: 8 ○ D: 10

5. $\lim\limits_{h \to 0} \dfrac{\cos h - 1}{h} =$

○ A: -1 ○ B: 0

○ C: 1 ○ D: 2

6. $\lim\limits_{x \to 0} \dfrac{x^4 + 5x - 3}{2 - \sqrt{x^2 + 4}}$ **= ?**

○ A: 6 ○ B: 15

○ C: ∞ ○ D: None of the above.

7. If f(x) = x^2 - 4, for what real number values of x will f(f(x))=0?

○ A: $\sqrt{6}$ ○ B: $\pm\sqrt{6}$

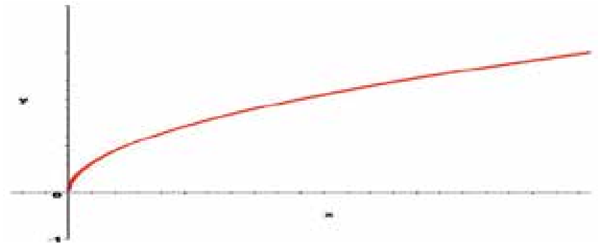
○ C: $\pm\sqrt{2} or \pm \sqrt{6}$ ○ D: No values

A straight line function, whose graph bisects the second and the fourth quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: a ○ B: -a

○ C: -2a ○ D: 0

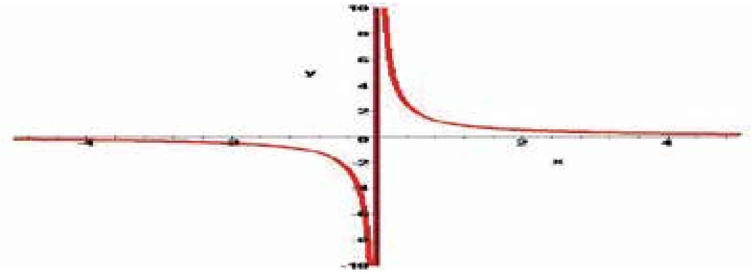
8. The following figure may show a graph of which function?



○ A: $y = \sqrt{x}$ ○ B: $y = \sqrt[6]{x}$

○ C: $y = \sqrt[5]{x}$ ○ D: Both A and B.

9. The figure shown below depicts a graph of which of the following functions?



○ A: $y=x+5$ ○ B: $y = x^2 / (x+2)$

○ C: $y = x^3 - 4$ ○ D: $y = 1 / x^3$

10. If $f(x) = 2^x$, then $f(\log_2 5)$=

○ A: 2^5 ○ B: 2^2

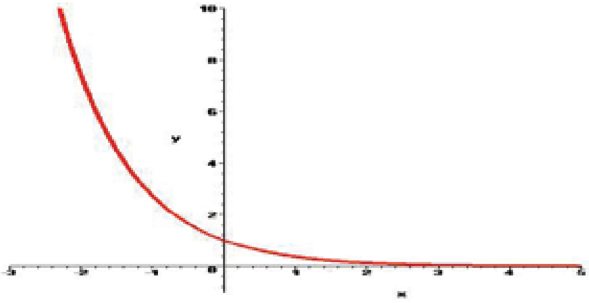
○ C: 2 ○ D: 5

11. If f is a linear function and f(1)=-2,f(-2)=1 and f(x)=1.5, what is x?

○ A: 0.5 ○ B: -0.5

○ C: -1.5 ○ D: -2.5

The wing figure shows a graph of which type of function?



○ A: Log function ○ B: Exponential Growth

○ C: Exponential Decay ○ D: None of the above.

12. If $f(x) = 3 - 2x + x^2$, then $\dfrac{f(x+t) - f(x)}{t}$ equals

○ A: t-x+4 ○ B: t+2

○ C: t+2x-2 ○ D: 2x-2

13. To show a function is continuous, we can do one of three things:

Show it satisfies the sequence definition of continuity, Show it satisfies the ε -> δ definition of continuity

Decompose it into simpler functions we already know to be continuous

○ A: Only (i) is correct. ○ B: Only (i) and (iii) are correct.

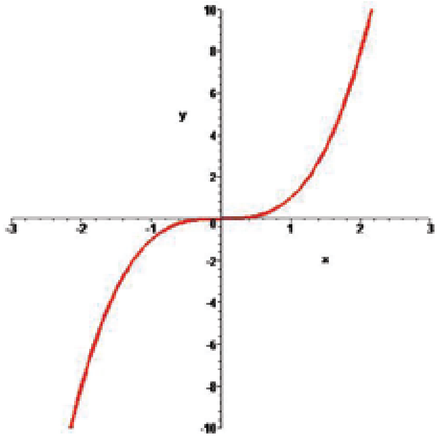
○ C: (i), (ii) and (iii) are correct. ○ D: None of these are correct.

14. **If** $f(x)=\left\{\begin{array}{lll}\frac{5}{x-2} & when & x\neq 2\\ k & when & x=2\end{array}\right\}$**, what must the value 'k' equal in order that f(x) be a continuous** function?

○ A: 2 ○ B: 5

○ C: 0 ○ D: No value of k will make f(x) a continuous function.

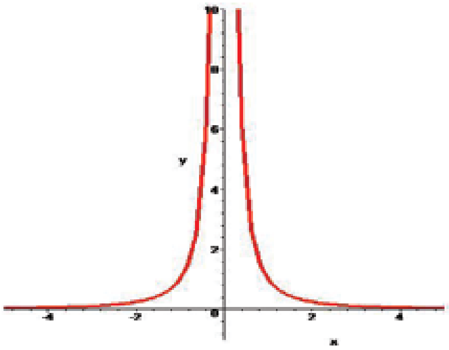
15. The following figure shows a graph of which type of function?



○ A: Linear Function ○ B: Even Degree Polynomial

○ C: Odd Degree Polynomial ○ D: None of the above.

16. The figure shown below depicts a graph of which of the following functions?



○ A: $y = x^2 + 2x + 3$ ○ B: $y = 1 / x^2$

○ C: $y = 1 / x^3$ ○ D: None of the above.

17. If $f(x)=\dfrac{3x-1}{2}$ **and f(g(x))=x, then g(x)=**

○ A: $\dfrac{2x-1}{3}$ ○ B: $\dfrac{2x+1}{3}$

○ C: $\dfrac{2x}{3}+1$ ○ D: $\dfrac{2x}{3}-2$

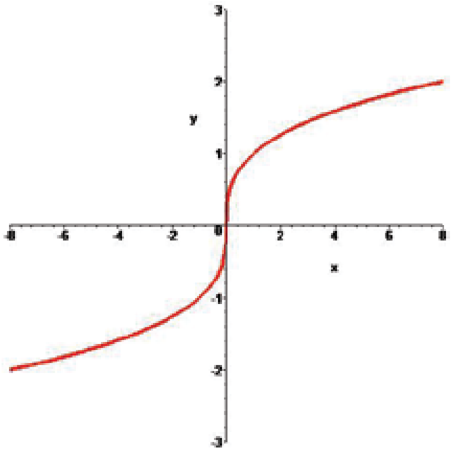
18. A straight line function, whose graph bisects the first and the third quadrants will have a value of .... , when the value of 'x' is 'a'.

○ A: 0 ○ B: 1

○ C: a ○ D: 2a

TEST 4

1. **The figure shown may depict a graph of which of the following functions?**



○ A: $y = \sqrt[3]{x}$ ○ B: $y = \sqrt[4]{x}$
○ C: Both A and B. ○ D: None of the above.

2. **Find** $\lim\limits_{x\to\infty} \dfrac{x^2+5x+1}{2x^2-10}$

○ A: 1/6 ○ B: 1/4
○ C: ½ ○ D: 1

3. **Domain of the function f(x) = $5x^3 + 4x^2 + 2x - 5$ is:**

○ A: $(-\infty, +\infty)$ ○ B: (-4,4)
○ C: (-5,5) ○ D: None of the above.

4. **f={(x,y):y=4}, g={(x,y):$x^2 - y^2$=1}, and h={(x,y):x=3}, which of the these is a function?**

○ A: f only ○ B: g only
○ C: h only ○ D: f and h only

5. **If f(x) = $x^2 + 1$ and f(g(x))=4x-3, then g(x)=**

○ A: $2\sqrt{x} - 1$ ○ B: $2\sqrt{x-1}$
○ C: $\sqrt{x-1}$ ○ D: x-4

6. **If g(x)=3x+2 and g(f(x))=x, then f(2)=**

○ A: 2 ○ B: 6
○ C: 0 ○ D: 8

7. **If f(x,y)=2x-y and g(z)=sin z, then** $g(f(\pi, \frac{\pi}{2}))$ **equals:**

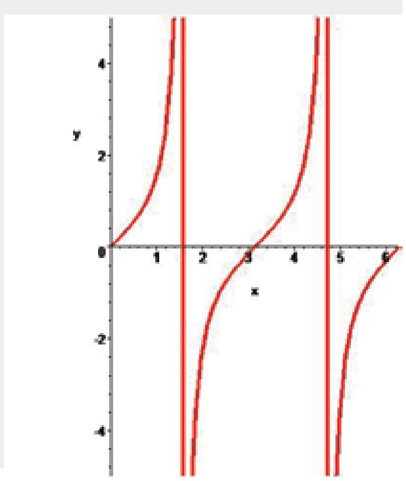
○ A: 0 ○ B: -1
○ C: 1 ○ D: 2

8. Which of the following is the inverse of the function $f(x) = \sqrt{x} - 1$, for all x>0?

○ A: $(x+1)^2$ ○ B: $x^2 + 2$

○ C: x+1 ○ D: x-2

9. The following figure shows a graph of which type of function?



○ A: Sine ○ B: Cosine

○ C: Tangent ○ D: Log

10. If $f(x) = x - \frac{1}{x}$, then $f(a) - f(\frac{1}{a})$ equals:

○ A: 0 ○ B: 2a - 2/a

○ C: a - 1/a ○ D: 1

11. If f(x)=2x-3, the inverse of f(x) could be represented by:

○ A: $f^{-1}(x) = 3x - 2$ ○ B: $f^{-1}(x) = \frac{1}{2x-3}$

○ C: $f^{-1}(x) = \frac{x+2}{3}$ ○ D: $f^{-1}(x) = \frac{x+3}{2}$

12. What value(s) must be excluded for the domain of $\frac{f}{g}(x)$ if $f(x) = 3x^2 - 4x + 1$ and $g(x) = 3x^2 - 3$?

○ A: 0 ○ B: 3

○ C: 1 ○ D: both ±1

13. $\lim\limits_{x=3} = \frac{5x^2 - 8x - 13}{x^2 - 5}$ **= ?**

○ A: 0 ○ B: 5

○ C: -2 ○ D: 2

14. If f(g(x)) = x^2 - 10 and g(x)=x+3 , then f(x)=

○ A: $x^2 + 6x + 8$ ○ B: $x^2 - 6x - 1$

○ C: $x^2 - 6x$ ○ D: $x^2 + 8$

15. If f(x)=x, the inverse of f, f^{-1}, could be represented by:

○ A: $f^{-1}(x) = x$

○ B: $f^{-1}(x) = 1$

○ C: $f^{-1}(x) = y$

○ D: $f^{-1}(x) = \frac{1}{x}$

16. If f(x) = x^3 - 4, then the inverse of f=

○ A: $-x^3 + 4$

○ B: $\sqrt[3]{x+4}$

○ C: $\sqrt{x-4}$

○ D: $\frac{1}{x-4}$

17. Find $\lim_{x \to 4} \frac{x^2 - 6x + 8}{x - 4}$.

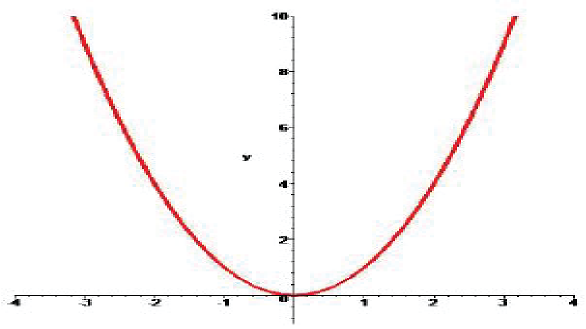
○ A: -2

○ B: 0

○ C: 2

○ D: 4

18. The following figure shows graph of which type of function?



○ A: Linear function

○ B: Even degree polynomial

○ C: Inverse of even degree polynomial

○ D: Inverse of odd degree polynomial

19. Find $\lim_{x \to \infty} \frac{3x^2 + 1}{4x^3 + 2x + 1}$

○ A: 0

○ B: 4

○ C: 10

○ D: 15

20. If f(x) = ax^2 + bx + c and f(1) = 3 and f(-1) = 3, then a+c equals

○ A: -3

○ B: 0

○ C: 3

○ D: 6

Differentiation

TEST 1

1. $\lim_{x \to 0} \frac{1 - \cos x}{x} = ?$

○ A: 1
○ B: 0
○ C: -1
○ D: Infinity

2. d/dx f(x).g(x) = ?

○ A: f(x).g(x)
○ B: f'(x).g(x) + f(x).g'(x)
○ C: f'(x).g(x) - f(x).g'(x)
○ D: f'(x).g'(x) + f(x).g(x)

3. d/dx $\mathrm{Sin}^{-1} x$ = ?

○ A: $1/(1-x^2)^{1/2}$
○ B: $- 1/(1-x^2)^{1/2}$
○ C: $1/(1+x^2)^{1/2}$
○ D: $-1/(1+x^2)^{1/2}$

4. What is the derivative of $(2x + 3)^5$?

○ A: $10(2x + 3)^4$
○ B: $10(2x + 3)^6$
○ C: $5(2x + 3)^4$
○ D: $5(2x + 3)^6$

5. dy/dx of f(x) = log(log (x)) is ?

(Please assume log as "Log to the base e" or Ln)

○ A: 1 / log x
○ B: x / log x
○ C: 1 / (x log x)
○ D: 2 / log x

6. $\frac{d}{dx} log(sin\, x) = ?$

○ A: tan x
○ B: cot x
○ C: 1 / sin x
○ D: 1 / cos x

7. If $y=e^x$, then the rate of change of y with respect to x at point (0,1) is?

○ A: e
○ B: 1
○ C: -1
○ D: 2

8. Under which of the following condition the given expression is true?

$$\frac{f(x_1) - f(x)}{x_1 - x} = f'(x)$$

○ A: As x approaches the value of x_1.
○ B: As x_1 approaches the value of x.
○ C: As x approaches the value of 0.
○ D: Both A and B.

9. $\lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} = ?$

○ A: f'(x)
○ B: ∫ f(x)dx
○ C: ∫ f'(x)dx
○ D: None of the above.

10. If $y = 1/x^2$ then dy/dx at $x = -2$ is ?

○ A: ¼
○ B: 1
○ C: ½
○ D: -1/2

11. d/dx sin x at $x = \pi/2$ is?

○ A: 1
○ B: -1
○ C: $\sqrt{2}/2$
○ D: 0

12. d/dx ($\cos^2 x + \sin^2 x$) = ?

○ A: 2 sin x + 2 cos x
○ B: 0
○ C: 2 sin x cos x
○ D: 1

13. Which of the following statement is false?

○ A: d/dx c = 0 ; where c is a constant.
○ B: d/dx [c f(x)] = c d/dx f(x)
○ C: d/dx [f(x) * g(x)] = d/dx f(x) * d/dx g(x)
○ D: d/dx [f(x) + g(x)] = d/dx f(x) + d/dx g(x)

14. Who is/or thought to be the inventor of differential calculus and fundamental theorums of calculus?

○ A: Albert Einstien.
○ B: Isaac Newton.
○ C: Gottfried Leibniz
○ D: Both B and C.

15. Derivative of ln e^{4x} w.r.t x is?

○ A: 4
○ B: 4x
○ C: $1/e^{4x}$
○ D: e^{4x}

16. The slope of a curve at point P = 7. If dx = 0.01 and it is very close to P then dy =?

○ A: 0
○ B: 0.7
○ C: 0.07
○ D: 0.49

17. The equation of a line is y = 9/4 x - 33. What is the property of dy/dx?

○ A: It is increasing.
○ B: It is decreasing.
○ C: It is a constant value.
○ D: It is first increasing and then decreasing.

18. $\frac{d}{dx}x^n \;=?$

○ A: nx
○ B: nx^n
○ C: nx^{n-1}
○ D: $1/n+1\ x^{n+1}$

19. What is the derivative of $1/(ax + b)^n$?

○ A: $-n(ax + b)^{-n-1}$
○ B: $-an(ax + b)^{n-1}$
○ C: $-an(ax + b)^{-n-1}$
○ D: $-n(ax + b)^{n-1}$

20. $\lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} =?$

○ A: f' (x)
○ B: dy / dx
○ C: ∫ f''(x)dx
○ D: All of the above.

TEST 2

1. **If the tangent to the graph of f(x) at the point "a" makes an angle of 45° with the x-axis, then what is the value of f'(x)?**

○ A: 0
○ B: 1
○ C: 2
○ D: Not enough information.

2. **The function f(x) = cot (x) sin (x) has how many stationary points in the interval [0 , 2π]?**

○ A: 0
○ B: 1
○ C: 2
○ D: 3

3. **Which of the following is the correct expansion of sin x as Maclaurin series?**

○ A: $1 - x + x^2 - x^3$ ....
○ B: $x - x^3/3! + x^5/5! - x^7/7!$ .....
○ C: 1 + x/1! - 2x/2! + 3x/3! .....
○ D: 1 + 0.1x + 0.01x + 0.001x ....

4. **Which of the following is not true?**

○ A: $a = d^2s/dt^2$
○ B: a = dv/dt
○ C: v = ∫ a dt
○ D: v = ∫ s dt

5. $\frac{d}{dx}(\frac{a+x}{a-x}) \ =?$

○ A: 0
○ B: $2(a+x) / (a-x)^2$
○ C: $2a / (a-x)^2$
○ D: $a / (a-x)^2$

6. **What are the two positive integers, whose sum is hundred and product is maximum?**

○ A: 30, 70
○ B: 45, 55
○ C: 43, 57
○ D: 50, 50

7. **Value of e is equal to which of the following infinite series?**

○ A: 1 + 1/1! + 1/2! + 1/3! ...
○ B: 1 + 0.1 + 0.01 + 0.001 ...
○ C: $1 - 1^3/3! + 1^5/5! - 1^7/7!$ ....
○ D: 1! - 2! + 3! - 4! ...

8. **What is the derivative of $(1 + \tan^2\theta)$ w.r.t tan θ?**

○ A: 2 sec θ
○ B: 2 tan θ
○ C: $\sec^2 \theta$
○ D: $2 \tan\theta \sec^2\theta$

9. **Which of the following is not true for function $f(x) = |4 - x^2|$?**

○ A: Function value is always positive.
○ B: Function is continuous.
○ C: Function is differentiable at x = +2 and -2.
○ D: Its domain is the set of all real numbers.

10. $\frac{d}{dx}e^{e^x} \ =?$

○ A: $e^x e^{e^x}$
○ B: e^{e^x}
○ C: e^{2x}
○ D: $1/e^x$

11. $\dfrac{d}{dx} tan^{-1}\sqrt{\dfrac{1-cos\,x}{1+cos\,x}}\ =?$

○ A: 1 ○ B: 2

○ C: ½ ○ D: -1/2

12. Maximum value of (ln x) / x is ?

○ A: 0 ○ B: 1

○ C: e ○ D: 1/e

The maximum area of a rectangle of perimeter 176 cm is?

○ A: 1854 cm^2 ○ B: 1936 cm^2

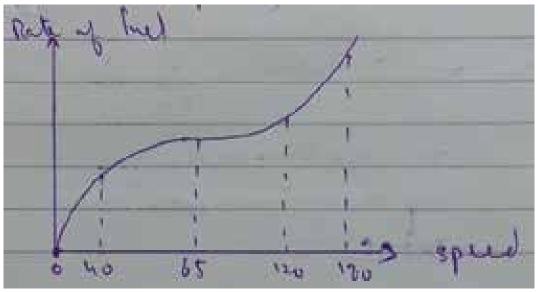
○ C: 2110 cm^2 ○ D: 3246 cm^2

13. What is the derivative of $(x^3+1)^9$?

○ A: $9(x^3+1)^8$ ○ B: $10(x^3+1)^{10}$

○ C: $9x^2\,(x^3+1)^8$ ○ D: $27x^2\,(x^3+1)^8$

14. The graph below shows the rate of fuel consumption with respect to the speed of the car. What is the most efficient speed with repect to the fuel consumption?



○ A: 40 ○ B: 65

○ C: 120 ○ D: 180

15. Critical point on the graph is the point for which?

○ A: f'(x) = 0 ○ B: f'(x) does not exist

○ C: f'(x) = 1 ○ D: Both A and B.

16. Derivative of an even function is always ?

○ A: An odd function ○ B: An even function

○ C: Negative function ○ D: Could be even or odd

17. If distance s of an object is given by the function $s=100t - 25t^2$, then what is the velocity at t= 1/2?

○ A: 25 ○ B: 50

○ C: 75 ○ D: 100

18. $x^2 + y^2 = 4$ is the equation of a circle. What is the slope at a point where x = 0?

○ A: 0 ○ B: 2

○ C: 4 ○ D: 1/2

19. If y = f(f(x)) ; f(0) = 0 and f'(0) = 1, then y'(0) is equal to ?

○ A: 0 ○ B: 1

○ C: 2 ○ D: 1/2

TEST 3

1. If $y = \left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \_\_\_ \infty\right)$, then $\frac{dy}{dx} =$

○ A: 0
○ B: 1
○ C: x
○ D: y

2. The function $x^3 + x^2 - 5x - 5$ is increasing at which interval?

○ A: (-infinity , - 5/3]
○ B: [1 , infinity)
○ C: [-5/3 , 1]
○ D: Both A and B.

3. d/dx cos(cos(cos x))) = ?

○ A: -sin [cos (cos x)].sin x cos x
○ B: - cos [sin (sin x)] sin x sin x
○ C: -sin [cos (cos x)] sin (cos x) sin x
○ D: sin [cos (cos x)] cos (cos x)

4. $\frac{d}{dx}[\cos^{-1}(4x^3 - 3x)] = ?$

○ A: $\frac{3}{\sqrt{1-x^2}}$
○ B: $\frac{-3}{\sqrt{1-x^2}}$
○ C: $\frac{3}{\sqrt{1+x^2}}$
○ D: $\frac{-3}{\sqrt{1+x^2}}$

5. y = |cos x| is not differentiable for x = ? (n in the given choices represent a set of integers)

○ A: nπ/2
○ B: (2n+1) π/2
○ C: nπ
○ D: (n+1) π

6. If $y = e^{2x + 3\log x}$, then dy/dx is equal to?

○ A: $x^2 e^{2x} (2x + 3)$
○ B: $x^2 e^{2x} (2x - 3)$
○ C: $x^3 e^{2x}$
○ D: $x^2 e^{2x} 2x$

7. If x > 0 and xy = 1, then the minimum value of (x + y) is?

○ A: -2
○ B: -1
○ C: 1
○ D: 2

8. The point at which the curve $y = x^3 - 4x + 3$ has gradient 8 is?

○ A: (2,3)
○ B: (4,5)
○ C: (1,0)
○ D: (0,1)

9. If x = (cos θ + θ sinθ), y = (sinθ - θ cos θ), then dy/dx is equal to ?

○ A: tan θ
○ B: cot θ
○ C: sin θ
○ D: cos θ

10. $\frac{d}{dx}\left(tan^{-1}\sqrt{\frac{1+\cos x}{1-\cos x}}\right) =?$

○ A: -1
○ B: 1
○ C: ½
○ D: -1/2

11. The graph f(x)=cot x has critical points at which of the following points in the interval [0,π]?

○ A: 0 and π

○ B: 0 and π/2

○ C: π and π/2

○ D: π/4 and π/2

12. The minimum value of $(x^2 + 250/x)$ = ?

○ A: 75

○ B: 50

○ C: 5

○ D: The function has no minimum value.

13. tan x is ____ function in the interval [0,π/2]?

○ A: Increasing

○ B: Decreasing

○ C: Constant

○ D: Discontinuous

14. The function $x^3 - 27x + 5$ is increasing when?

○ A: $|x| > 3$

○ B: $|x| < 3$

○ C: $x < -3$

○ D: $x > 3$

15. If $y = \tan^{-1}(\sqrt{1 + x^2} + x)$, then $\frac{dy}{dx}$ = ?

○ A: $1 / 2(1+x^2)$

○ B: $-1 / 2(1+x^2)$

○ C: $1 / 2(1-x^2)$

○ D: $2 / (1-x^2)$

16. The point on the curve y = √x at which the tangent makes an angle of 45° with x axis is?

○ A: (1,1)

○ B: (1/16,1/4)

○ C: (4,2)

○ D: (1/4, 1/2)

17. If $y = 12x^9 + 13x^7 + 5x^5 + 19$ then which of the following is true?

○ A: $d^5y/dx^5 = 0$

○ B: $d^7y/dx^7 = 0$

○ C: $d^9y/dx^9 = 0$

○ D: $d^{10}y/dx^{10} = 0$

18. If x > 0, y > 0 and x + y = 18, then the maximum value of xy is?

○ A: 77

○ B: 81

○ C: 85

○ D: 144

19. If √x + √y = √a then dy/dx = ?

○ A: $(y/x)^{1/2}$

○ B: $(x/y)^{1/2}$

○ C: $-(y/x)^{1/2}$

○ D: $-(x/y)^{1/2}$

20. Derivative of $a^{\sqrt{x}}$ = ?

○ A: $a^{\sqrt{x}} \ln a$

○ B: $a^{\sqrt{x}}$

○ C: $a^{\sqrt{x}} / \ln a$

○ D: $a^{\sqrt{x}} \ln a / 2\sqrt{x}$

TEST 4

1. **What is $d^{19}y/dx^{19}$ if $y = e^{-x}$?**

   ○ A: e^{-x}
   ○ B: $-e^{-x}$
   ○ C: $19e^{-x}$
   ○ D: $-19e^{-x}$

2. **The position of an object is given by $x = 15t - 5t^3$ where x is the position. What is the acceleration of the object when it is momentarily at rest?**

   ○ A: 0
   ○ B: 1
   ○ C: 15
   ○ D: -30

3. **A rectangle has perimeter 100m. Its maximum area would be?**

   ○ A: 480 m^2
   ○ B: 625 m^2
   ○ C: 690 m^2
   ○ D: 765 m^2

4. **The maximum value of function f(x) = sin x cos x is?**

   ○ A: 1
   ○ B: 2
   ○ C: ½
   ○ D: 0

5. **If x = log t and $y = t^2 - 1$, then the value of d^2y/dx^2 at t = 1 is?**

   ○ A: 1
   ○ B: 2
   ○ C: 3
   ○ D: 4

6. **What is the second derivative of $(3t + 2)^{-2}$ with respect to t?**

   ○ A: $-6(3t + 2)^{-3}$
   ○ B: $6(3t + 2)^{-4}$
   ○ C: $54(3t + 2)^{-3}$
   ○ D: $54(3t + 2)^{-4}$

7. **What is the derivative of sin x w.r.t cos x?**

   ○ A: cos x
   ○ B: tan x
   ○ C: - cot x
   ○ D: - cos x sin x

8. **d/dx sin x^o = ? (x is in degrees)**

   ○ A: cos x^o
   ○ B: x cos x^o
   ○ C: (- π/180) cos x^o
   ○ D: (π/180) cos x^o

9. $\frac{d}{dx}e^{ln\, sin\, x^2} =?$

   ○ A: 2x cos x^2
   ○ B: x cos x^2
   ○ C: cos x^2
   ○ D: 1/sinx * 2 $e^{\sin x}$

10. **If d/dx $(3x^3 + x)$ = d/dx $(-3x^2 - 5)$ then x = ?**

    ○ A: 1 or 2
    ○ B: -1/3
    ○ C: 0 or -1/3
    ○ D: 0 or 1

11. **$d(x^x)$ / dx = ?**

    ○ A: x^x (1 + log x)
    ○ B: 1 + log x
    ○ C: log x
    ○ D: x log x

12. If $y = 3x^2 - 12x + 8$ then the slope of tangent at point (3,-1) is?

○ A: -18
○ B: 6
○ C: -19
○ D: 8

13. The curve y = sin (x) with domain = set of all real numbers has how many stationary points?

○ A: Infinite
○ B: 0
○ C: 1
○ D: 2

14. The derivative of e^x sinx w.r.t. e^x is

○ A: cos x + sin x
○ B: cos x
○ C: sin x
○ D: e^x(sin x + cos x)

15. If $\sin x = \frac{t}{\sqrt{1+t^2}}$, then $\frac{dx}{dt}$ is equal to

○ A: 1
○ B: $1 / (1+t^2)$
○ C: $1 / (1 - t)^{1/2}$
○ D: $1 / (1 + t^2)^{1/2}$

16. Differentiating $\ln(x^2 + 2x)$ w.r.t x gives?

○ A: $1 / (x^2+2x)$
○ B: ln (2x + 2)
○ C: (2x+2) / x
○ D: $(2x+2) / (x^2+2x)$

17. If $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \ldots \text{to } \infty}}}$, then $\frac{dy}{dx}$ is equal to

○ A: x / (2y - 1)
○ B: x / (2y + 1)
○ C: log x / (2y - 1)
○ D: 1 / x(2y - 1)

18. If $y = \tan^{-1}\left(\frac{\sqrt{1+x^2} - 1}{x}\right)$ and $\theta = \tan^{-1}x$, then $\frac{dy}{d\theta} = ?$

○ A: 1
○ B: 1/2
○ C: -1/2
○ D: x/2

19. What is the derivative of $(x^2 + 1)(x^3 + 7)$ w.r.t x is?

○ A: $5x^3 + 15x + 14$
○ B: $5x^4 + 3x^2 + 14x$
○ C: $6x^3$
○ D: $6x^3 + 7$

20. The graph of function y = x^3 has a _____ point at x = 0 ?

○ A: Inflection
○ B: Stationary
○ C: Turning
○ D: Both A & B.

Integration

TEST 1

1. **$\int f(x)g'(x)\,dx = ?$**

○ A: $f(x)g(x) - \int g(x)f'(x)\,dx$ ○ B: $f(x)g(x) + \int g(x)f'(x)\,dx$
○ C: $f(x)g(x) - \int g'(x)f(x)\,dx$ ○ D: $f(x)g(x) + \int g'(x)f(x)\,dx$

2. **$\int \cot x\,dx = ?$**

○ A: $\ln|\cos x| + c$ ○ B: $\ln|\sec x| + c$
○ C: $\ln|\sin x| + c$ ○ D: $\ln|\operatorname{cosec} x| + c$

3. $\int_0^{3\pi/2} cos(x)dx \ = ?$

○ A: 0 ○ B: 1
○ C: 3 ○ D: -1

4. $\int \frac{\tan\sqrt{x}}{\sqrt{x}}\,dx =$

○ A: $\ln|\cos\sqrt{x}|$ ○ B: $2\ln|\cos\sqrt{x}|$
○ C: $\ln|\sec\sqrt{x}|$ ○ D: $2\ln|\sec\sqrt{x}|$

5. **The solution of the differential equation dy/dx = 2xy is?**

○ A: $y = ce^{-x^2}$ ○ B: $y = ce^{x^2}$
○ C: $y^2 = 2x^2 + c$ ○ D: None of the above.

6. $\int_0^{\pi} sin(x)dx \ = ?$

○ A: 0 ○ B: 1
○ C: 2 ○ D: $\sqrt{2}$

7. **$\int (3x^2 - 2x + 1)\,dx = ?$**

○ A: $x^3 - x^2 + 1 + c$ ○ B: $x^3 - x + 1 + c$
○ C: $x^3 - x^2 + x + c$ ○ D: $x^3 + x^2 + x + c$

$\int \sec x \tan x\,dx = ?$

○ A: $\tan x + c$ ○ B: $\cot x + c$
○ C: $\operatorname{cosec} x + c$ ○ D: $\sec x + c$

8. $\int_{-2}^{3} x^2dx \ = ?$

○ A: 8/3 ○ B: 19/3
○ C: 28/3 ○ D: 35/3

9. If $f(x) = x^2$ then find dy when x = 3 and dx = 0.01?

○ A: 0.02
○ B: 0.04
○ C: 0.06
○ D: 0.08

10. $$\int tan^2x\,dx \quad =?$$

○ A: $2 \tan x \sec^2 x + c$
○ B: $\tan x + x + c$
○ C: $\tan x - x + c$
○ D: None of the above.

11. $\int [f(x)]^{-1} f'(x)dx = ?$ **$(f(x) > 0)$**

○ A: $f(x) + c$
○ B: $\ln | \ln f(x) | + c$
○ C: $\ln f(x) + c$
○ D: $[f(x)]^{n+1} / (n+1)$

12. $$\int_1^2 (2x^5 - x + 3)dx \quad =?$$

○ A: 45/2
○ B: 39/2
○ C: 17/2
○ D: None of the above.

13. $\int dx/(ax + b) =?$

○ A: $\ln|ax + b| + c$
○ B: $1/a \ln|ax + b| + c$
○ C: $1/b \ln|ax + b| + c$
○ D: $1/a \ln|a| + c$

14. Which of the following mathematical function gives the area under the curve?

○ A: Differentiation
○ B: Integration
○ C: Vector product
○ D: Both B and C.

15. $$\int x\, sinx\, dx \quad =?$$

○ A: $x \sin x + \cos x + c$
○ B: $- x \sin x + \cos x + c$
○ C: $x \cos x + \sin x + c$
○ D: $- x \cos x + \sin x + c$

16. $$\int \frac{x}{(1+x^4)} dx =$$

○ A: $\tan^{-1} x^2 + c$
○ B: $1/2 \tan^{-1} x^2 + c$
○ C: $\cot^{-1} x^2 + c$
○ D: $1/2 \cot^{-1} x^2 + c$

17. $\int (2x + 3)^{1/2} dx = ?$

○ A: $1/3 (2x + 3)^{3/2} + c$
○ B: $1/2 (2x + 3)^{3/2} + c$
○ C: $1/3 (2x + 3)^{1/2} + c$
○ D: $2/3 (2x + 3)^{3/2} + c$

18. $\int \tan x \sec^2 x\, dx = ?$

○ A: $\sec^2 x / 2 + c$
○ B: $\tan^2 x / 2 + c$
○ C: $\tan^2 x$
○ D: $1/2 (\cos x)^2$

19. What is the solution of the equation?

$(\sin y) (\operatorname{cosec} x)\, dy/dx = 1$

○ A: $\sin y = \sin x + c$
○ B: $\sin y = - \sin x + c$
○ C: $\cos y = \cos x + c$
○ D: $\cos y = - \cos x + c$

TEST 2

1. $\int \frac{1-x^2}{1+x^2}dx$ **= ?**

○ A: $x + \text{Tan}^{-1} x + c$
○ B: $x - \text{Tan}^{-1} x + c$
○ C: $-x + 2\text{Tan}^{-1} x + c$
○ D: $-x - 2\text{Tan}^{-1} x + c$

2. $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx \; =?$

○ A: 20/3
○ B: 14/3
○ C: 8/3
○ D: 5/3

3. The family of curve $y = Ax + A^3$ is represented by the differential equation of degree?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

4. $\int \frac{\cos x - \sin x}{\cos x + \sin x} dx \; =?$

○ A: $-\ln(\cos x - \sin x) + c$
○ B: $-\ln(\cos x + \sin x) + c$
○ C: $\ln(\cos x - \sin x) + c$
○ D: $\ln(\cos x + \sin x) + c$

5. $\int \frac{\cos x}{\sqrt{1 + \sin x}} dx = ?$

○ A: $-(1+\sin x)^{1/2} + c$
○ B: $2(1+\sin x)^{1/2} + c$
○ C: $0.5\,(1+\sin x)^{1/2} + c$
○ D: $-0.5\,(1+\sin x)^{1/2} + c$

6. $\int a^{\lambda x + y}\, dx$ **=?**

○ A: $1/(\lambda \ln a)\, a^{\lambda x + y} + c$
○ B: $1/(\ln a)\, a^{\lambda x + y} + c$
○ C: $1/(\lambda \ln a)\, a^{x + y} + c$
○ D: $1/(\ln a)\, a^{x + y} + c$

7. The order of a differential equation whose solution is y = a cos x + b sin x, where a and b are arbitrary constants, is?

○ A: 1
○ B: 2
○ C: 3
○ D: Cannot be determined.

8. $\int x \ln x \, dx = ?$

○ A: $0.5\,x^2(\ln x - 0.5) + c$
○ B: $x^2(\ln x + 0.5) + c$
○ C: $1.5\,x(\ln x + 1) + c$
○ D: $x^2(\ln x - x) + c$

9. The order and the degree of the differential equation $d^2s/dt^2 + 4 = 0$ are?

○ A: Order is 2 and degree is 2
○ B: Order is 2 and degree is 3
○ C: Order is 1 and degree is 2
○ D: None of the above.

10. $\int \ln(\tan x) \sec^2 x \, dx = ?$

○ A: $\ln(\tan x) + \tan x + c$
○ B: $\tan x \ln(\tan x) - \tan x + c$
○ C: $\ln(\tan x) - \sec x + c$
○ D: $\tan x \ln(\tan x) + \tan x + c$

11. $\int \frac{1-\tan^2 x}{1+\tan^2 x} dx =$

○ A: sin 2x
○ B: 1/2 sin 2x
○ C: cos 2x
○ D: 1/2 cos 2x

12. The solution of the differential equation $\frac{dy}{dx} + \frac{1+\cos 2y}{1-\cos 2x} = 0$ is

○ A: tan y + cot x = c
○ B: tan y . cot x = c
○ C: tan y - cot x = c
○ D: tan y = c . cot x

13. Which of the following is an ordinary differential equation?

○ A: $2y + 8x = \frac{d(\cos x)}{dx}$
○ B: $\frac{d(y+x)}{dx} = x^2 + \sin x$
○ C: $\frac{d(\cos x + \tan x)}{dx} = x + 2y$
○ D: All of the above.

14. $\int \sec^2 x\,\mathrm{cosec}^2 x\,dx = ?$

○ A: tan x cot x
○ B: tan x + cot x
○ C: tan x - cot x
○ D: - tan x cot x

15. $\int \tan^2 x\,dx = ?$

○ A: tan x + x + c
○ B: tan x - x + c
○ C: $\sec^2 x - x + c$
○ D: $\mathrm{cosec}^2 x + x + c$

16. $\int \frac{1}{(1+x^2)Tan^{-1}x} dx \ = ?$

○ A: $1/x \ln|\mathrm{Tan}^{-1} x| + c$
○ B: $-1/x \ln|\mathrm{Tan}^{-1} x| + c$
○ C: $-\ln|\mathrm{Tan}^{-1} x| + c$
○ D: $\ln|\mathrm{Tan}^{-1} x| + c$

17. The solution of the differential equation y dy/dx = x - 1, satisfying x = 1 and y = 1, is?

○ A: $y^2 = 2x^2 - x - 1$
○ B: $y^2 = x^2 - 2x + 2$
○ C: $y = x^2 - 2x + 3$
○ D: $y^2 = 2x^2 - x - 3$

18. $\int ln\, x\, dx \ = ?$

○ A: x (1 – ln x) + C
○ B: x (ln x - 1) + C
○ C: (1 + x) ln x + C
○ D: (1 - x) ln x + C

19. A particle moves in a straight line with a velocity given by dx/dt = x + 1 (x is the distance described). The time taken by a particle to traverse a distance of 99 meters is?

○ A: log 10e
○ B: $2 \log_e 10$
○ C: 2 log 10 e
○ D: 0.05 log10 e

20. The number of arbitrary constants in the second order differential euqation is?

○ A: 0
○ B: 1
○ C: 2
○ D: Infinite

TEST 3

1. $\int \frac{cos2x - 1}{1 + cos2x} dx \ \ =?$

○ A: - tan x + x + c
○ B: tan x + x + c
○ C: x - sec x + c
○ D: x + sec x + c

2. $\int e^{-ln\,x}\,dx \ \ =?$

○ A: $e^{-\ln x}$
○ B: ln |x|
○ C: $-e^{-\ln x}$
○ D: $-x\,e^{-\ln x}$

3. $\int_0^1 \frac{dx}{(1 + x^2)^{3/2}} \ \ =?$

○ A: 1
○ B: √2
○ C: 1/√2
○ D: 3/√2

4. The solution of the equation $(e^x + 1)y\,dy = (y + 1)e^x\,dx$ is ?

○ A: $y = e^x(e^x + 1) + C$
○ B: $(y + 1) = e^{2x} + C$
○ C: $y = e^x / x + C$
○ D: $C(1 + y)(1 + e^x) = e^y$

5. The differential equation of all circles of radius 'r' is of order?

○ A: 1
○ B: 2
○ C: 3
○ D: 4

6. What is the solution of the differential equation,

$(x\sqrt{1 + y^2})dx + (y\sqrt{1 + x^2})dy = 0$

○ A: $(1+y^2)^{1/2} + (1 + x^2)^{1/2} = c$
○ B: $\log(1 + y^2) + \log(1 + x^2) = 2c$
○ C: $\sin^{-1} y + \sin^{-1} x = c$
○ D: $\tan^{-1} y + \tan^{-1} x = c$

7. $\int \frac{e^{tan^{-1}x}dx}{1 + x^2}$ **= ?**

○ A: $xe^{tan^{-1}x} + c$
○ B: $(tan^{-1}x)e^{tan^{-1}x} + c$
○ C: $tan^{-1}x + c$
○ D: $e^{tan^{-1}x} + c$

8. $\int_0^{2\pi} cos^2\theta\,d\theta \ \ =?$

○ A: π
○ B: 2π
○ C: 3π/2
○ D: 3

9. $\int_0^{\pi} \sqrt{1 + sin\,x}\,dx \ \ =?$

○ A: 2
○ B: 4
○ C: √2
○ D: 2√2

10. $\int |x|\,dx = ?$

○ A: $x^2 / 2$
○ B: $- x^2 / 2$
○ C: $x\,|x| / 2$
○ D: 1

11. $\int \frac{\sec x \ \mathrm{cosec}\ x}{\log \tan x} dx =$

○ A: log [log tan x] + C
○ B: cot (log x) + C
○ C: tan (log x) + C
○ D: None of the above.

12. If $\int x^6 \sin(5x^7) dx = \frac{k}{5}\cos(5x^7),\ x \neq 0$, then

○ A: $k = -1/7$
○ B: $k = 1/7$
○ C: $k = -7$
○ D: $k = 7$

13. $\int \frac{dx}{e^x + e^{-x}} \ = ?$

○ A: $\log (e^x + 1) + C$
○ B: $\log (e^x + e^{-x}) + C$
○ C: $\tan^{-1} e^x + C$
○ D: $\sin^{-1} e^x + C$

14. The value of $\int \frac{(x - x^3)^{1/3}}{x^4} dx$ is

○ A: $(3/8)\,(1/x^2 - 1)^{4/3} + C$
○ B: $- (3/8)\,[(1/x^2) - 1]^{4/3} + C$
○ C: $(1/8)\,(1 - 1/x^2)^{4/3} + C$
○ D: $- (1/8)\,(1 - 1/x^2)^{4/3} + C$

15. $\int \frac{\cos x}{\sin x \,.\, \ln \sin x} dx \ = ?$

○ A: - ln |ln sin x| dx
○ B: - ln |ln cos x| dx
○ C: ln |ln sin x| dx
○ D: ln |ln cos x| dx

16. $\int_0^{2\pi} \sqrt{1 + \sin(x/2)}\, dx \ = ?$

○ A: 2
○ B: 4
○ C: 8
○ D: 0

17. $\int \sin^{-1} x\, dx \ = ?$

○ A: $x \cos^{-1} x + (1 - x^2)^{1/2} + C$
○ B: $x \sin^{-1} x + C$
○ C: $x \sin^{-1} x + (1 - x^2)^{1/2} + C$
○ D: $- \sin^{-1} x + (1 - x^2)^{1/2} + C$

18. $\int_0^{\pi/2} \sin x\, e^{\cos x} dx \ = ?$

○ A: 1
○ B: e - 1
○ C: e
○ D: -1

19. $\int \frac{xe^x}{(1+x)^2}dx \ =?$

○ A: (1 + 2x e^x) / (1 + x)
○ B: (1 - 2x e^x) / (1 + x)
○ C: - e^x / (1+x)
○ D: e^x / (1+x)

20. The equation of the curve through the point (1, 0) and whose slope is $\frac{y-1}{x^2-x}$ is

○ A: (y - 1)(x + 1) + 2x = 0
○ B: 2x(y - 1) + x + 1 = 0
○ C: x(y - 1)(x + 1) + 2 = 0
○ D: y(y - 1)(x - 1) + 2 = 0

TEST 4

1. $\int \sqrt{1+cos(x/4)}\,dx \ =?$

○ A: 8 √2 sin (x/8) + C
○ B: - 8 √2 sin (x/8) + C
○ C: 8 √2 cos (x/8) + C
○ D: - 8 √2 cos (x/8) + C

2. $\int_0^{\pi/2} sin^2x\,dx \ =?$

○ A: π
○ B: π/2
○ C: π/3
○ D: π/4

3. $\int_0^{\pi} \sqrt{1-cos\,x}\,dx \ =?$

○ A: 1
○ B: √2
○ C: 2√2
○ D: 2

4. $\int_0^{\pi/2} sin(x)sin(2x)dx \ =?$

○ A: 1/3
○ B: 2/3
○ C: 1
○ D: pi

5. Which of the following statement is false?

○ A: The degree of the differential equation is the highest power of the highest order differential coefficient occurring in it.
○ B: The order of the differential equation is the highest order derivative occurring in the equation.
○ C: The order of a differential equation is unique.
○ D: The order of a differential equation is any integer.

6. ∫ cos √x dx = ?

○ A: [√ x sin √x + cos √x] + C
○ B: 2[√x sin √x + cos √x] + C
○ C: [√ x sin √x - cos √x] + C
○ D: 2[√x sin √x - cos √x] + C

7. The differential equation $x\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + y = x^2$ is of

○ A: Degree 4 and order 2
○ B: Degree 4 and order 3
○ C: Degree 3 and order 2
○ D: Degree 2 and order 3

8. What is the solution of the differential equation?

$x\,dy + y(x - 1)dx = 0$

○ A: $y = c\,xe^{x}$
○ B: $y = c\,xe^{-x}$
○ C: $y = c\,e^{-x}$
○ D: $y = c\,xe^{x+1}$

9. $\int [f(x)]^n f'(x)\,dx = ?$

○ A: $\ln f(x) + c$
○ B: $-\ln f(x) + c$
○ C: $[f(x)]^{n+1} / (n+1)$
○ D: $[f(x)]^{n} / (n+1)$

10. $\int x^2 e^{x^3} \cos(e^{x^3})dx$ is equal to

○ A: $\frac{1}{3}sin(e^{x^3}) + c$
○ B: $sin(e^{x^3}) + c$
○ C: $3sin(e^{x^3}) + c$
○ D: $-sin(e^{x^3}) + c$

11. If $dr/dt = -rt$ and $r(0) = r_0$, then which of the following is correct?

○ A: $r = r_o e^{-t}$
○ B: $r = r_o e^{-t/2}$
○ C: $r = r_o e^{-t.t}$
○ D: $r = r_o e^{-t.t/2}$

12. $\int \frac{e^{2x} + e^x}{e^x} dx \;\; = ?$

○ A: $e^x + 1 + c$
○ B: $2x\,e^x + c$
○ C: $e^{2x} + 1 + c$
○ D: $e^x + x + c$

13. δy for any function $f(x)$ is given by?

○ A: $f(\delta x)$
○ B: $f(x + \delta x)$
○ C: $f(x + \delta x) + f(x)$
○ D: $f(x + \delta x) - f(x)$

14. $\int_0^{\pi/2} cos^2 x\, dx \;\; = ?$

○ A: π
○ B: $\pi/2$
○ C: $\pi/3$
○ D: $\pi/4$

15. The solution of the equation $y\,dx + x\,dy = 0$ is?

○ A: $xy = c$
○ B: $x/y = c$
○ C: $x + y = c$
○ D: $x - y = c$

Analytic Geometry

TEST 1

1. **Equation of a line parallel to x axis at a distance 'a' below the x axis is?**

○ A: $x = a$ ○ B: $x = - a$
○ C: $y = - a$ ○ D: $y = a$

2. **What is the equation of a line perpendicular to a line with slope = -6? The line has y intercept of 4/3.**

○ A: $y = x + 8$ ○ B: $y = -6x + 4/3$
○ C: $6y = x + 8$ ○ D: $y = x + 3/4$

3. **The angle bisectors of a triangle are?**

○ A: Perpendicular ○ B: Concurrent
○ C: Non-concurrent ○ D: Parallel

4. **The equation of family of lines perpendicular to line $3x + 4y + 7 = 0$, is?**

○ A: $4x + 3y + k = 0$ ○ B: $4x - 3y + k = 0$
○ C: $3x - 4y + k = 0$ ○ D: $3x + 4y + k = 0$

5. **If m_1 and m_2 are the slopes of the perpendicular lines. Which of the following is true?**

○ A: $m_1 = m$ ○ B: $m_1 = - m_2$
○ C: $m_1 m_2 - 1 = 0$ ○ D: $m_1 m_2 + 1 = 0$

6. **Angle between lines $2x^2 - 7xy + 3y^2 = 0$, is?**

○ A: 45° ○ B: 60°
○ C: 90° ○ D: 30°

7. **What is the distance between the points A (7,5) and B (2,-6) ?**

○ A: $\sqrt{73}$ ○ B: $\sqrt{146}$
○ C: $\sqrt{183}$ ○ D: $\sqrt{219}$

8. **Equation of x axis is?**

○ A: $y = 0$ ○ B: $x = 0$
○ C: $x = y$ ○ D: $y = 1$

9. **What is the y intercept of the line $x - \sqrt{3}y + 10 = 0$**

○ A: $10/\sqrt{3}$ ○ B: $-10/\sqrt{3}$
○ C: 10 ○ D: -10

10. **The mid point of line joining points A (3 ,1) and B(-2,-4) is?**

○ A: (5/2 , 5/2) ○ B: (3/2, 1/2)
○ C: (-1, -2) ○ D: (1/2 , -3/2)

11. **If inclination of a line is 45° then the slope is?**

○ A: 0 ○ B: 1
○ C: -1 ○ D: Infinity.

12. The point (-4,-2) lies on a circle. What is the length of the radius of this circle if the center is located at (-8,-10)?

○ A: $\sqrt{47}$
○ B: $\sqrt{80}$
○ C: $\sqrt{95}$
○ D: $\sqrt{108}$

13. If two medians of a triangle ABC pass through point (1,-2) then the third median pass through?

○ A: (0,0)
○ B: (-2,1)
○ C: (-1,-2)
○ D: None of the above.

14. Which of the following statement is true about any triangle?

○ A: Altitudes and right bisectors are concurrent.
○ B: Altitudes and right bisectors are non-concurrent.
○ C: Altitudes are concurrent and right bisectors are not concurrent.
○ D: Altitudes are not concurrent and right bisectors are concurrent.

15. If m_1 and m_2 are the slopes of two lines then the tangent of angle between the lines is equal to?

○ A: $(m_2 - m_1) / (1 - m_1m_2)$
○ B: $(m_2 + m_1) / (1+m_1m_2)$
○ C: $(m_2 + m_1) / (1 - m_1m_2)$
○ D: $(m_2 - m_1) / (1+m_1m_2)$

16. In the straight equation $x \cos a + y \sin a = P$, P represents?

○ A: Y intercept
○ B: X intercept
○ C: Mid point of the line.
○ D: Length of perpendicular from the origin to the line

17. What is the point of intersection for $5x + 7y = 35$ and $3x - 7y = 21$?

○ A: (5,7)
○ B: (7,0)
○ C: (3,-7)
○ D: (4,3)

18. If points A(a,b) ; B(c,d) and C(e,f) are collinear. Then the area of the triangle ABC is?

○ A: 0
○ B: 1
○ C: 2
○ D: 3

19. The point p (x,y) such that $x>0$ and $y<0$ lies in?

○ A: Quadrant I
○ B: Quadrant II
○ C: Quadrant III
○ D: Quadrant IV

20. What is the slope of the line $ax + by + c = 0$?

○ A: 0
○ B: Infinite
○ C: -c/b
○ D: -a/b

TEST 2

1. **What is the symmetric form of the equation $5x - 12y + 39 = 0$?**

○ A: $\frac{x + 39/5}{12/13} = \frac{y}{5/13}$ ○ B: $(-5/13)x + (12/13)\,y = 3$

○ C: $(-5/39)x + (12/39)\,y = 1$ ○ D: $y = (5/12)\,x + (39/12)$

2. **The equation of line parallel to x-axis and bisecting the join of (1, 4) and (− 2, 6) is?**

○ A: $y = 3$ ○ B: $y = 5$

○ C: $y + 2 = 5$ ○ D: $x = 5$

3. **What is the equation of a line passing through the point (4,2) and parallel to the line connecting points (0,-1) and (7,-15)?**

○ A: $y + 2x + 10 = 0$ ○ B: $y + 2x - 10 = 0$

○ C: $2y + 3x - 7 = 0$ ○ D: $2y + 3x + 7 = 0$

4. **The two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are perpendicular if?**

○ A: $a_1b_2 - a_2b_1 = 0$ ○ B: $a_1a_2 - b_1b_2 = 0$

○ C: $a_1b_2 + a_2b_1 = 0$ ○ D: $a_1a_2 + b_1b_2 = 0$

5. **The three lines $a_1x + b_1y + c_1 = 0$; $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if and only if?**

○ A: $a_1 = a_2 = a_3$ and $b_1 = b_2 = b_3$ and $c_1 = c_2 = c_3$

○ B: $a_1 + b_1 + c_1 = 0$ ○ C:

○ D:

6. **If P(1, 2), Q(4, 6), R(5, 7) and S(a, b) are the vertices of a parallelogram PQRS, then?**

○ A: $a = 0, b = 4$ ○ B: $a = 3, b = 4$

○ C: $a = 2, b = 3$ ○ D: $a = 3, b = 5$

7. **The equation of general form $ax^2 + 2hxy + by^2$ represents?**

○ A: A line ○ B: A curve

○ C: A pair of lines ○ D: A pair of lines through the origin

8. **Centroid of a triangle divides each median in the ratio?**

○ A: 1:1 ○ B: 1:2

○ C: 2:1 ○ D: 1:3

9. **Find the radius of a circle whose diameter has endpoints (-3, -2) and (7, 8)?**

○ A: $10\sqrt{2}$ ○ B: $2\sqrt{10}$

○ C: $5\sqrt{2}$ ○ D: $2\sqrt{5}$

10. **The angle between the pair of lines represented by the equation $2x^2 + 3xy - 5y^2 = 0$ is?**

○ A: None of the above. ○ B: $\tan^{-1}(4/3)$

○ C: $\tan^{-1}(11/3)$ ○ D: $\tan^{-1}(7/3)$

11. Of $P_1(x_1,y_1)$ and $P_2=(x_2,y_2)$ are two points such that line joining P_1P_2 is parallel to x axis then?

○ A: $x_1 = x_2$

○ B: $y_1 = x_2$

○ C: $x_1 = y_2$

○ D: $y_1 = y_2$

12. The equation of a straight line that intersects x axis at point 2 and y axis at point -4 is?

○ A: $y - 2x + 4 = 0$

○ B: $y - 2x - 4 = 0$

○ C: $2x - y + 4 = 0$

○ D: $x - 2y + 4 = 0$

13. For a pair of lines represented by general equation $ax^2 + 2hxy + by^2$, if $h^2 > ab$ then?

○ A: Lines are real and distinct.

○ B: Lines are real and coincident.

○ C: Lines are imaginary.

○ D: Lines do not pass through the origin.

14. What is the equation of the line intersecting $3x - 4y - 10 = 0$ and $x + 2y - 10 = 0$ and having a zero slope?

○ A: $2x + 3y - 18 = 0$

○ B: $y = 2$

○ C: $x = 9$

○ D: $2x + 3y + 18 = 0$

15. Slope of a line is negative if the angle z it froms with the x axis is?

○ A: $z = 0$

○ B: $z > 90$

○ C: $0 < z < 90$

○ D: $90 < z < 180$

16. If three points A(a,b), B(c,d) and C(e,f) are collinear then?

○ A: Slope of AB is not equal to the slope of BC

○ B: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$

○ C: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 1$

○ D: None of the above.

17. The equation below shows which form of the straight line equation?

$$\frac{x - x_1}{\cos\alpha} = \frac{y - y_1}{\sin\alpha}$$

○ A: Normal form

○ B: Two point form

○ C: Symmetric form

○ D: Point slope form

18. What is the distance between two parallel lines $2x - 5y + 13 = 0$ and $2x - 5y + 6 = 0$?

○ A: 3/28

○ B: 9/32

○ C: $7/\sqrt{29}$

○ D: $4/\sqrt{63}$

19. What is the normal form of the straight line equation $5x - 12y + 39 = 0$?

○ A: This equation cannot be represented in the two point form.

○ B: $y = (5/12)\,x + 39/12$

○ C: $(-5/39)\,x + (12/39)\,y = 1$

○ D: $(-5/13)\,x + (12/13)\,y = 3$

20. The points of line $|x| = |y|$ may lie in which quadrant?

○ A: Quadrant I

○ B: Quadrant I & III

○ C: Quadrant II and IV

○ D: Quadrant I, II , III or IV

TEST 3

1. **Find the value of k in the equation (3x - 4y - 10) + k(x + 2y - 10) = 0 such that the line is perpendicular to a line with slope 3/4?**

○ A: 4 ○ B: 5

○ C: 6 ○ D: 7

2. **The pair of lines represented by the equation $2x^2 + 49xy - 2y^2$are?**

○ A: Imaginary. ○ B: Parallel

○ C: Perpendicular ○ D: None of the above.

3. **The straight lines given below form what kind of triangle?**

$x + y - 4 = 0$, $3x + y - 4 = 0$, $x + 3y - 4 = 0$

○ A: Isoceles ○ B: Equlateral

○ C: Right angled ○ D: None of the above.

4. **Pair of lines represented by the equation $2x^2 + 8xy + 8y^2$ are?**

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imginary. ○ D: None of the above.

5. **What is the value of h such that points (-1,h) , (3,2) and (7,3) are collinear?**

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

6. **The lines px + qy + r = 0, qx + ry + p = 0, rx + py + q = 0 are concurrent if?**

○ A: $p + q + r = 0$ ○ B: $p^2 + q^2 + r^2 + pq + qr + rp = 0$

○ C: $p^2 + q^2 + r^2 + 3pqr = 0$ ○ D: All of the above.

7. **The equation of base of an equilateral triangle is x + y = 2 and the vertex opposite to this base is (2, − 1). Then the length of the side of triangle equals?**

○ A: √3 ○ B: √1 / √3

○ C: √2 / √3 ○ D: √3 / √2

8. **For a pair of Imaginary lines represented by the equation $ax^2 + 2hxy + by^2$. Which of the following is true?**

○ A: The imaginary lines never intersect.

○ B: They intersect at (0,0) ○ C: They intersect at postivie y axis.

○ D: They intersect at negative y axis.

9. **If vertices of triangle ABC are A(2,2), B(-4,-4) and C(5,-8). Then the length of median through C is?**

○ A: √65 ○ B: √75

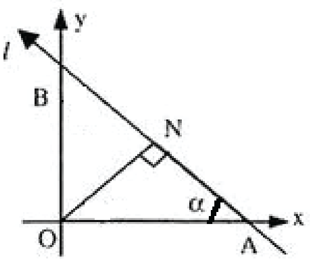
○ C: √85 ○ D: √95

10. **For a pair of lines represented by the equation $3x^2 + 4xy + 9y^2$, the lines are?**

○ A: Real and distinct. ○ B: Real and coincident.

○ C: Imaginary. ○ D: Not passing through the origin.

11. What the equation of a line at a distance 5 units from the origin, having angle $\alpha = 30^o$ as shown in the figure below?



○ A: $\sqrt{3}x + y = 10$

○ B: $x + \sqrt{3}y = 10$

○ C: $\sqrt{3}x + y = 5$

○ D: $x + \sqrt{3}y = 5$

12. Which of the following is true about the two points (0,0) and (-4,7) with respect to the line $2x - 3y + 6 = 0$?

○ A: They both lie on the line.

○ B: They both lie above the line.

○ C: They both lie below the line.

○ D: They lie on the opposite sides of the line.

13. What is the radius of circle inscribed in the triangle formed by lines $x = 0$, $y = 0$ and $4x + 3y - 24 = 0$?

○ A: 2

○ B: $2\sqrt{2}$

○ C: 3

○ D: 4

14. Equation of the right bisector of the line segment joining points (7,4) and (-1,-2) is?

○ A: $4x + 3y - 10 = 0$

○ B: $4x + 3y - 15 = 0$

○ C: $3x - 4y + 7 = 0$

○ D: $3x - 4y - 7 = 0$

15. The line segment joining the point (-3,-4) and (1,-2) is divided by the y axis in ratio?

○ A: 1:1

○ B: 2:1

○ C: 3:1

○ D: 4:1

16. If the coordinates of the mid point of the triangle are (1,-1), (2,3) and (3,2) then the area of triangle is?

○ A: 3/2

○ B: 9/2

○ C: 6

○ D: 11/2

17. The straight lines $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form which of the following triangles?

○ A: Isoceles

○ B: Equilateral

○ C: Right Angled

○ D: None of the above.

18. Points A(1, 3) and C(5, 1) are opposite vertices of a rectangle ABCD. If the slope of BD is 2, then its equation is

○ A: $2x - y = 4$

○ B: $2x + y = 4$

○ C: $2x + y = 7$

○ D: $2x - y = -7$

19. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product then c has the value?

○ A: -1

○ B: 1

○ C: -2

○ D: 2

20. Equation of the line passing through the point (1,-2) and cutting off equal intercepts from the axis would be?

○ A: $x + y = 1$

○ B: $x + y + 1 = 0$

○ C: $x - y = 1$

○ D: $x - y + 1 = 0$

TEST 4

1. For a pair of lines represented by the equation $ax^2 + 2hxy + by^2$, which of the following is true if the lines are parallel?

○ A: $h^2 = 0$

○ B: $h^2 > ab$

○ C: $h^2 < ab$

○ D: $h^2 - ab = 0$

2. If point A (-1,2) is the center of a circle and point B (7,5) lies on the circle. The diameter of circle is?

○ A: 9

○ B: $\sqrt{45}$.

○ C: $\sqrt{73}$.

○ D: $2\sqrt{73}$

3. The coordinate axis is changed through the point O' (2,3). If coordinates of a point P in new axis are (-1,4) then the original coordinates of P were?

○ A: (0,0)

○ B: (2,3)

○ C: (1,7)

○ D: (3,-1)

4. The point P (x,y) with $x<0$ and $y<0$ lies in which quadrant?

○ A: Quadrant I

○ B: Quadrant II

○ C: Quadrant III

○ D: Quadrant IV

5. What are the new coordinates of the point P(5,3), if the axis is rotated by angle 45°?

○ A: (4,2)

○ B: $(\sqrt{2}, 2\sqrt{2})$

○ C: $(2\sqrt{2}, -\sqrt{2})$

○ D: $(4\sqrt{2}, -\sqrt{2})$

6. Inclination of the line $y = -x$ is?

○ A: 45°

○ B: 135°

○ C: 225°

○ D: 315°

7. What is the angle between the lines L_1 joining points (1,-7) and (6,-4) and L_2 joining points (-1,2) and (-6,-1)?

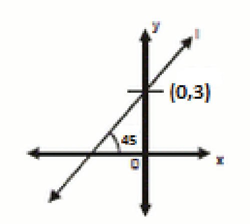
○ A: 0

○ B: 30

○ C: 45

○ D: 60

8. The equation of the line given below is?

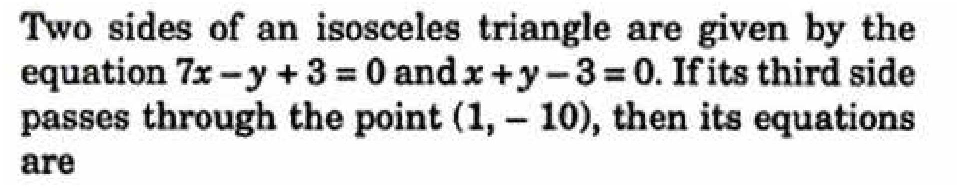


○ A: $y = 3x - 1$

○ B: $y = 3x + 1$

○ C: $y + x = 3$

○ D: $y = x + 3$

9. 

Two sides of an isosceles triangle are given by the equation $7x - y + 3 = 0$ and $x + y - 3 = 0$. If its third side passes through the point (1, – 10), then its equations are

○ A: x - 3y - 31 = 0 or 3x + y + 7 = 0 ○ B: x - y - 31 = 0 or x + y + 7 = 0

○ C: 2x - 3y - 11 = 0 or x + 4y + 9 = 0 ○ D: x + y + 1 = 0 or 5x - y + 10 = 0

10. Equation of the line through the point (2,3) and perpendicular to the line joining (-5,6) and (-6,5) is given by?

○ A: x - y + 5 = 0 ○ B: x + y + 5 = 0

○ C: x - y - 5 = 0 ○ D: x + y - 5 = 0

11. The extremities of diagonal of a parallelogram are the points (3, − 4) and (− 6, 5). If the third vertex is (− 2, 1), then the fourth vertex will be?

○ A: (0,1) ○ B: (1,0)

○ C: (1,1) ○ D: (-1,0)

12. Orthocenter of a triangle is defined as the point of intersection of?

○ A: Altitudes ○ B: Angle bisectors

○ C: Medians ○ D: None of the above.

13. If the lines represented by equation $Ax^2 + 2Hxy + By^2 = 0$ are perpendicular, then?

○ A: A + H = 0 ○ B: A + B = 0

○ C: H = 0 ○ D: A/B = H/B

14. What is the equation of the lines passing through the point (-5,-3) and (9,-1) ?

○ A: x - 7y - 16 = 0 ○ B: x - 7y + 16 = 0

○ C: x + 7y + 16 = 0 ○ D: x + 7y - 20 = 0

15. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. Then PQRS must be a?

○ A: General parallelogram ○ B: Rectangle

○ C: Rhombus ○ D: None of the above.

16. A line passes through point (4, 1) and is perpendicular to line 3x + y = 3, then its x − intercept is?

○ A: ½ ○ B: 2/3

○ C: 1 ○ D: 3/2

17. The line passing through point (1,2) and perpendicular to x + y + 1 = 0 is?

○ A: y - x + 1 = 0 ○ B: y - x - 1 = 0

○ C: y - x + 2 = 0 ○ D: y - x - 2 = 0

18. Distance between two lines defined by x + 3 = 0 and x - 3 = 0 is?

○ A: 0 ○ B: 3

○ C: 6 ○ D: 9

19. M is the midpoint of line AB. The coordinates of A are (-2,3) and the coordinates of M are (1,0). The coordinates of B are?

○ A: (-1/2,3/2)
○ B: (4,-3)
○ C: (4,6)
○ D: (-4,-3)

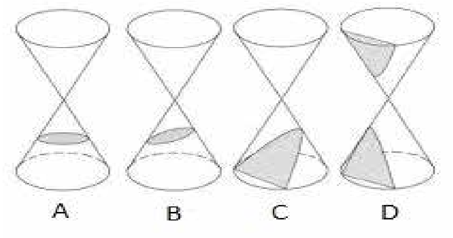
20. If a line passing through the points (x_1, y_1) and (x_2, y_2) such that $x_1 = x_2$ then the slope of the line is?

○ A: Zero
○ B: Positive
○ C: Negative
○ D: Undefined

Conic Sections

TEST 1

1. **Which of the following cutting of a cone represents a circle?**



○ A: A
○ B: B
○ C: C
○ D: D

2. **Eccentricity of ellipse is?**

○ A: Equal to 1.
○ B: Greater than zero and less than 1.
○ C: Greater than one.
○ D: Zero

3. **Center and radius of the circle represented by $x^2 + y^2 = 9$ is?**

○ A: (1,1) and 9
○ B: (1,1) and 3
○ C: (0,0) and 9
○ D: (0,0) and 3

4. **Equation of a circle cannot have a term?**

○ A: x
○ B: y
○ C: xy
○ D: All of the above.

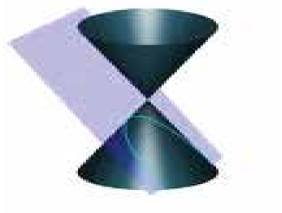
5. **The center of the circle represented by the equation $(x - 3)^2 + (y + 4)^2 = 4$ is?**

○ A: (3,4)
○ B: (-3,-4)
○ C: (-3,4)
○ D: (3,-4)

6. **What is the focus of the ellipse $x^2/16 + y^2/4 = 1$?**

○ A: $(\pm 2\sqrt{3}, 0)$
○ B: $(\pm \sqrt{3}, 0)$.
○ C: $(\pm 2\sqrt{5}, 0)$.
○ D: $(\pm \sqrt{5}, 0)$.

7. **The plane cutting a double cone as shown in the figure below would get a/an?**

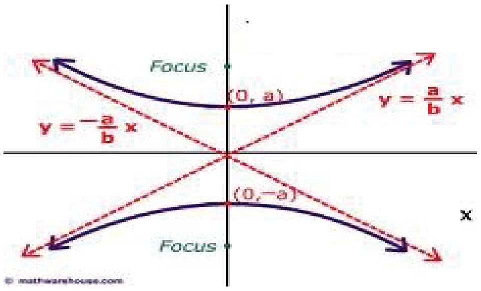


○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

8. **The equation $x^2/a^2 + y^2/b^2 = 1$ represents a verticle ellipse if?**

○ A: $a^2 = b^2$
○ B: $a^2 < b^2$
○ C: $a^2 > b^2$
○ D: None of the above.

9. The equation of the given hyperbola is of form?

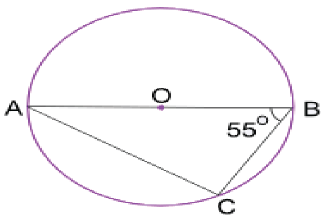


○ A: $x^2/a^2 + y^2/b^2 = 1$
○ B: $x^2/b^2 + y^2/a^2 = 1$
○ C: $x^2/a^2 - y^2/b^2 = 1$
○ D: $y^2/a^2 - x^2/b^2 = 1$

10. When the cutting of a conic section is parallel to the axis of the cone and intersects both nappes, it represents a/an?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

11. What is angle CAB in the given figure?



○ A: 35°
○ B: 45°
○ C: 55°
○ D: 65°

12. A line $y = mx + c$ intersects a circle $x^2 + y^2 = a^2$. The point of intersection are imaginary if?

○ A: $a^2 (1+m^2) - c^2 > 0$
○ B: $a^2 (1+m^2) - c^2 = 0$
○ C: $a^2 (1+m^2) - c^2 < 0$
○ D: Intersection points are never imaginary.

13. If a circle is represented by the equation $x^2 + y^2 + 4x - 6y - 12 = 0$. Then the point (-5,6) is?

○ A: Inside the circle
○ B: Outside the circle.
○ C: On the circle.
○ D: Center of the circle.

14. Circle is a special case of ellipse with eccentricity = ?

○ A: -1
○ B: 0
○ C: 1
○ D: 2

15. The parametric form of equation (a cos Θ, b sin Θ) is for?

○ A: Circle
○ B: Hyperbola
○ C: Ellipse
○ D: Parabola

16. Equation of the directrices of hyperbola $y^2/a^2 - x^2/b^2 = 1$ is given by?

○ A: $x = \pm c/e^2$
○ B: $x = \pm b/e$
○ C: $y = \pm c/e^2$
○ D: $y = \pm b/e$

17. If $e > 1$ then the conic section is a?

○ A: Parabols ○ B: Ellipse

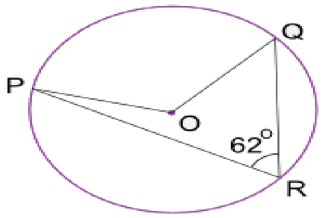
○ C: Hyperbola ○ D: Circle.

18. If a plane cutting one section of a double cone is slightly tilted and not parallel to the generator of the cone, we get a/an?

○ A: Circle ○ B: Parabola

○ C: Hyperbola ○ D: Ellipse

19. What is the angle POQ in the given diagram?



○ A: 62° ○ B: 102°

○ C: 124° ○ D: 132°

20. Focal chord perpendicular to the axis of the parabola is called?

○ A: Directrix. ○ B: Tangent Chord

○ C: Latusrectum. ○ D: Vertex.

TEST 2

1. **For a general form of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, the radius is given by**?

○ A: $g + f + c$ ○ B: $\sqrt{g^2 + f^2}$

○ C: $\sqrt{g^2 + f^2 - c}$ ○ D: $\sqrt{g^2 + f^2 + c}$

What is the eccentricity of the ellipse given by equation $x^2/9 + y^2/4 = 1$?

○ A: 5/3 ○ B: √5/3

○ C: 2/3 ○ D: √2/3

2. **The equations $x = at^2$, $y = at$; $t \in R$ represents?**

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

3. **Intersecting properties of conic sections were discovered by?**

○ A: Pythagoras ○ B: Eudoxus and Georg Cantor

○ C: Euclid ○ D: Apollonius and Pappus

4. **What are the coordinates of the focus of the parabola $x^2 - 4x - 8y - 4 = 0$?**

○ A: (2,-1) ○ B: (2,1)

○ C: (-2,-1) ○ D: (2,0)

5. **What is the focus of the parabola $4x - y^2 = 2y + 13$?**

○ A: (3,-1) ○ B: (3,1)

○ C: (4, 1) ○ D: (4, -1)

6. What are the foci of hyperbola $x^2/9 - y^2/4 = 1$?

○ A: $(\pm\sqrt{5}, 0)$ ○ B: $(0, \pm\sqrt{5})$

○ C: $(0, \pm\sqrt{13})$ ○ D: $(\pm\sqrt{13}, 0)$

7. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x-a)$ is?

○ A: 90° ○ B: 60°

○ C: 45° ○ D: 30°

8. Equation of a line tangent to ellipse at $x^2/a^2 + y^2/b^2 = 1$ at points (4,10) is?

○ A: $4x/a^2 + 10y/b^2 = 1$ ○ B: $10x/a^2 + 4y/b^2 = 1$

○ C: $16x/a^2 + 100y/b^2 = 1$ ○ D: $100x/a^2 + 16y/b^2 = 1$

9. The line $y = 2x + c$ is tangent to the ellipse $x^2/16 + y^2/4 = 1$ if c equals?

○ A: $\sqrt{29}$ ○ B: $\sqrt{60}$

○ C: $\sqrt{68}$ ○ D: $\sqrt{74}$

10. What is the center of the ellipse $x^2 + 4y^2 + 4x - 24y + 24 = 0$?

○ A: (-2,3) ○ B: (-2, -3)

○ C: (2,3) ○ D: (2,-3)

11. Which of the following is not an equation of a circle?

○ A: $x^2 + y^2 - x + 98y + 11 = 4$ ○ B: $x^2 + y^2 + 18x + 98y + 11 = 0$

○ C: $5x^2 + 5y^2 + 14x + 12y - 10 = 0$ ○ D: $x^2 + 3y^2 + 10x - 9y + 11 = 0$

12. Latusrectum of the parabola $y^2 = -4ax$ is?

○ A: $x = a$ ○ B: $x = -a$

○ C: $y = a$ ○ D: $y = -a$

13. The equations $x = a \cos \theta$, $y = b \sin \theta$, $0 \le \theta < 2\pi$, $a \neq b$, represents?

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

14. The vertex of the parabola $(y - a)^2 = 4a (x - a)$ is?

○ A: (0,a) ○ B: (a,0)

○ C: (0,0) ○ D: None of the above.

15. A second degree equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a parabola if?

○ A: $h^2 - ab = 0$ ○ B: $h^2 - ab > 0$

○ C: $h^2 - ab < 0$ ○ D: None of the above.

16. What is the length of the major axis for the ellipse $x^2/16 + y^2/4 = 1$?

○ A: 2 ○ B: 4

○ C: 6 ○ D: 8

17. The equation $y = mx + a/m$ is tangent to $y^2 = 4ax$ for m = ?

○ A: 0 ○ B: 1

○ C: All positive values ○ D: All nonzero values

18. What is the center of a circle represented by a general form $5x^2 + 5y^2 + 24x + 36y + 10 = 0$?

○ A: (-12/5 , -18/5) ○ B: (12/5 , 18/5)

○ C: (-9/5 , -7/5) ○ D: (9/5 , 7/5)

19. The interior of a satellite dish has diameter 12 ft and 2 ft deep as shown in the figure below. What is the distance from the center of the dish to the focus?

○ A: 4.5 ft ○ B: 5.5 ft
○ C: 6.0 ft. ○ D: 6.2 ft

TEST 3

1. Minimum number of non-collinear points on a circle required to form an equation of a circle are?

○ A: 2 ○ B: 3
○ C: 4 ○ D: 5

2. The foci of an ellipse are (0, ± 1) and minor axis is of unit length. The equation of the ellipse is ?

○ A: $2x^2 + 4y^2 = 5$ ○ B: $4x^2 + 2y^2 = 5$
○ C: $15x^2 + 6y^2 = 1$ ○ D: $20x^2 + 4y^2 = 5$

3. The sum of distances of any point on the ellipse $3x^2 + 4y^2 = 24$ from its foci is?

○ A: 8 units ○ B: $2\sqrt{2}$ units
○ C: $4\sqrt{2}$ units ○ D: 7 units

4. The line $y + 2x - 5 = 0$ with respect to the circle $x^2 + y^2 + 2x - 9 = 0$?

○ A: Cuts the circle at two distinct points.
○ B: Tangent to the circle. ○ C: Do not touch the circle.
○ D: None of the above.

5. If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then a is equal to?

○ A: 15/16 ○ B: 9/7
○ C: 5/4 ○ D: 2/3

6. What is the equation of tangent to the circle $x^2 + y^2 + 5/3\,x - 13/3\,y + 2/3 = 0$ at (1, 10/3)?

○ A: $21x - 33y + 89 = 0$ ○ B: $33x + 21y + 157 = 0$
○ C: $8x + 46y - 22 = 0$ ○ D: $3x + 19y + 27 = 0$

7. What is the equation of a circle with diameter between two points A (2,3) and B (4,6)?

○ A: $x^2 + y^2 + 3x - 9y - 23 = 0$ ○ B: $x^2 + y^2 - 9x - 2y + 11 = 0$
○ C: $x^2 + y^2 - 6x - 9y + 26 = 0$ ○ D: Cannot be determined from the given information.

8. If e_1 and e_2 are eccentricities of the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$ and $x^2/b^2 - y^2/a^2 = 1$ then?

○ A: $e_1 = e_2$ ○ B: $e_1 * e_2 = 1$
○ C: $e_1 + e_2 = 0$ ○ D: $1/e_1^2 + 1/e_2^2 = 1$

9. The line $y = 2x + c$ is a tangent to the parabola $y^2 = 16x$ if c equals?

○ A: 2 ○ B: 1/2
○ C: 0 ○ D: -1/2

10. The equation of the circle whose diameter is the latusrectum of the parabola $x^2 = 4y$ is?

○ A: $x^2 + (y-1)^2 = 4$ ○ B: $(x - 2)^2 + (y - 1)^2 = 4$

○ C: $y^2 + (x-1)^2 = 4$ ○ D: $y^2 + (x-1)^2 = 2$

11. Line $y = 2c$ is a tangent to the parabola $y^2 = 4ax$ if c is equal to?

○ A: 0 ○ B: 4

○ C: 2a ○ D: None of the above.

12. The line $5y + 12x - 39 = 0$ to the circle $x^2 + y^2 = 9$?

○ A: Cuts the circle in two distinct points.

○ B: Do not touch the circle ○ C: Is tangent to circle

○ D: Cuts the circle at two imaginary points

13. What is the equation of a circle passing through non collinear points A(5, 8) and B(-2,9)?

○ A: $x^2 + y^2 + 4x - 12y - 20 = 0$ ○ B: $x^2 + y^2 + 4x - 9y - 15 = 0$

○ C: $x^2 + y^2 + 9x - 7y + 3 = 0$ ○ D: Equation cannot be formed from the given information.

14. What is the focus of the ellipse given by the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$?

○ A: $(1, \pm\sqrt{5})$ ○ B: $(1,-1\pm\sqrt{5})$

○ C: $(1,1\pm\sqrt{5})$ ○ D: $(1\pm\sqrt{5}, -1)$

15. $x = \dfrac{e^t + e^{-t}}{2}$, $y = \dfrac{e^t - e^{-t}}{2}$; $t \in R$ represents

○ A: A circle ○ B: A parabola

○ C: A hyperbola ○ D: An ellipse

16. The line $y = mx + 1$ is tangent to parabola $y^2 = 4x$ if m = ?

○ A: 1 ○ B: 2

○ C: 3 ○ D: 4

17. Slope of the normal at point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is?

○ A: 1/t ○ B: t

○ C: -t ○ D: -1/t

18. What is the equation of the asymptotes for the given hyperbola?

$4x^2 - 9y^2 - 32x - 18y + 19 = 0$.

○ A: $(y + 1) = \pm 2/3\ (x - 4)$ ○ B: $(y + 1) = \pm 4/9\ (x - 4)$

○ C: $(y - 1) = \pm 2/3\ (x + 4)$ ○ D: $(y - 1) = \pm 4/9\ (x + 4)$

19. The general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents a hyperbola if?

○ A: $h^2 - ab < 0$ ○ B: $h^2 - ab = 0$

○ C: $h^2 - ab > 0$ ○ D: None of the above.

20. The point on the curve $y^2 = x$, where the tangent line makes an angle of 45° with the x-axis is?

○ A: (3/4,1/2) ○ B: (1/4,1/2)

○ C: (1/4,3/2) ○ D: (1,2)

TEST 4

1. Parametric form of equation for a cricle is?

○ A: $(a \sec \Theta, b \tan \Theta)$
○ B: $(r \cos \Theta, r \sin \Theta)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(at^2 , 2at)$

2. What is the vertex of the parabola $y = -2x^2 + 4x + 1$?

○ A: (2,1)
○ B: (-2,-1)
○ C: (-1,-3)
○ D: (1,3)

3. If one foci of the ellipse is at (-3,0) and the ellipse is centered around the origin. What is the distance between the two foci of the ellipse?

○ A: Cannot be determined.
○ B: 9
○ C: 6
○ D: 3

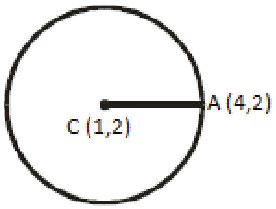
4. What is the focus of the parabola $y^2 - x - 2y + 2 = 0$?

○ A: (3/4 , 1)
○ B: (1/4 , 0)
○ C: (1/4 , 1)
○ D: (5/4 , 1)

5. Axis of the parabola $9y^2 -16x -12y - 57 = 0$ is?

○ A: 2/3
○ B: 3/2
○ C: -2/3
○ D: -3/2

6. What is the equation of the circle given in the figure below?



○ A: $(x - 1)^2 + (y - 2)^2 = 16$
○ B: $(x + 1)^2 + (y + 2)^2 = 9$
○ C: $(x - 1)^2 + (y - 2)^2 = 9$
○ D: $(x - 1)^2 + (y + 2)^2 = 16$

7. Parametric form of equation for a parabola is?

○ A: $(r \cos \Theta, r \sin \Theta)$
○ B: $(at^2 , 2at)$
○ C: $(a \cos \Theta, b \sin \Theta)$
○ D: $(a \sec \Theta, b \tan \Theta)$

8. The equation of the parabola with focus at (0, a) and directrix $y + a = 0$ is ($a > 0$) ?

○ A: $x^2 = 4ay$
○ B: $x^2 = -4ay$
○ C: $y^2 = 4ax$
○ D: $y^2 = -4ax$

9. The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is?

○ A: (4,4)
○ B: (2,2)
○ C: $(\sqrt{2}, 2)$
○ D: $(2\sqrt{2}, 2)$

10. For a general equation $Ax^2 + By^2 + Gx + Fy + C = 0$, if A is not equal to B and both have opposite signs then it represents?

○ A: Circle
○ B: Parabola
○ C: Hyperbola
○ D: Ellipse

11. The line $y = mx + c$ is tangent to the ellipse $x^2/a^2 + y^2/b^2 = 1$ if?

○ A: $c = a/m$

○ B: $c^2 = a^2 m^2 + b^2$

○ C: $c^2 = a^2 m^2 - b^2$

○ D: None of the above.

12. If a is the major axis, b is the minor axis and e is the eccentricity of an ellipse. Its directrices are given by?

○ A: $\pm c/e$

○ B: $\pm b/e$

○ C: $\pm a/e$

○ D: $\pm b/e^2$

13. The equation $(y - y_1)(x_1 + g) = (x - x_1)(y_1 + f)$ represents?

○ A: Tangent to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)

○ B: Normal to the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ at point (x_1 , y_1)

○ C: Chord of a circle $x^2 + y^2 + 2gx + 2fy + c = 0$ through point (x_1 , y_1)

○ D: None of the above.

14. If the length of major axis of ellipse is 2a and length of minor axis is 2b. Then the length if latusrectum is approximately?

○ A: $4b/a$

○ B: $4a^2/b$

○ C: $2b^2/a$

○ D: $a/2b$

15. When the cutting of a conic section is perpendicular to the axis of the cone, it represents a/an?

○ A: Circle

○ B: Parabola

○ C: Hyperbola

○ D: Ellipse

16. What is the length of the tangent from point (-5, 10) to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$?

○ A: $\sqrt{29}$

○ B: $\sqrt{67}$

○ C: $\sqrt{102}$

○ D: $\sqrt{133}$

17. From a point P outside a circle, how many tangents can be drawn?

○ A: 1

○ B: 2

○ C: 3

○ D: 4

18. What is the radius of a circle represented by the equation $x^2 + y^2+12x - 10y = 0$?

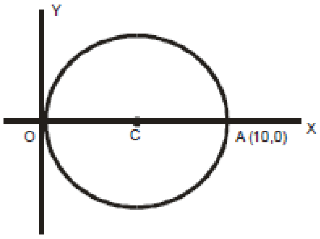
○ A: $\sqrt{61}$

○ B: $\sqrt{55}$

○ C: $\sqrt{52}$

○ D: $\sqrt{47}$

19. Equation of the circle given in the figure below is?



○ A: $x^2 + y^2 = 25$

○ B: $(x-5)^2 + y^2 = 25$

○ C: $(x + 5)^2 + y^2 = 25$

○ D: $(x + 5)^2 + y^2 = 10$

20. Find the equation of an ellipse with centre (0,0), focus (0,-3) and one vertes at (0,4)?

○ A: $x^2/16 + y^2/7 = 1$

○ B: $x^2/7 + y^2/16 = 1$

○ C: $x^2/\sqrt{7} + y^2/4 = 1$

○ D: $x^2/7 + y^2/4 = 1$

Vectors

TEST 1

1. **What are the direction cosines of unit vector**

$$\hat{\underline{v}} = \left[\frac{6}{\sqrt{41}}, \frac{-2}{\sqrt{41}}, \frac{1}{\sqrt{41}}\right]$$

○ A: 0, 0, 0
○ B: -6/√41 , +2/√41, -1/√41
○ C: 6/√41 , -2/√41, 1/√41
○ D: None of the above.

2. **If volume of a parallelepiped with a ,b , c as co-terminus edges is 36 the volume of the tetrahedron with the same edges is?**

○ A: 13
○ B: 12
○ C: 6
○ D: 3

3. **Value of [i, i , k] is?**

○ A: 0
○ B: 1
○ C: -1
○ D: √-1

4. **The value of 2*i* x 4*k* =?**

○ A: 0
○ B: 8k
○ C: -8j
○ D: 8j

5. **The volume of the parallelepiped with *u* , *v* and *w* as its coterminus edges is?**

○ A: u.(v x w)
○ B: 1/2 * u.(v x w)
○ C: 1/6 * u.(v x w)
○ D: u x (v x w)

6. **If ā is a unit vector. Then the value of ā.ƀ is? Assume that the two vectos are not perpendicular to each other.**

○ A: 0
○ B: 1
○ C: ā cos θ
○ D: ƀ cos θ

7. **Which of the following statement is true?**

○ A: Only dot product possesses distributive property
○ B: Only cross product possesses distributive property
○ C: Both dot and cross product possess distributive property
○ D: Neither dot nor cross product possess distributive property

8. **The value of (2*j x i*) - 3*k* = ?**

○ A: -5k
○ B: 5k
○ C: k
○ D: -k

9. **Find the magnitude of vector v = -3i + 4j ?**

○ A: 2
○ B: 3
○ C: 4
○ D: 5

10. **If terminal point of a vector coincides with its origin point then it is called?**

○ A: Unit Vector.
○ B: Null Vector.
○ C: Equity Vector.
○ D: Negative Vector.

11. If ā = [1,-3] and б = [2,5] ; 4ā + 2б = ?

○ A: [3,2]
○ B: [8,2]
○ C: [-8,2]
○ D: [8,-2]

12. If ā, б and c are three vectors representing three edges of a parallelepiped. Its volume is given by?

○ A: ā x б x c
○ B: ā . б . c
○ C: ā . (б x c) / 2
○ D: ā . (б x c)

13. If three vectors are coplanar then their scalar triple product is?

○ A: 0
○ B: 1
○ C: -1
○ D: Equal to vector triple product.

14. i.j = ?

○ A: 0
○ B: 1
○ C: -1
○ D: k

15. If ā = i - k and б = j + k then the projection of ā along б is?

○ A: $-1/\sqrt{2}$
○ B: $1/\sqrt{2}$
○ C: 1
○ D: -1

16. If k is a scalar ā x kб = ?

○ A: kā x б
○ B: k (ā x б)
○ C: kā x kб
○ D: Both A and B.

17. If ā = [2,1,3] and б = [-1,4,0]. What is the magnitude of ā - 2б?

○ A: 16
○ B: $\sqrt{74}$
○ C: $\sqrt{93}$
○ D: 36

18. What is the unit vector for v = 3i - j +2k?

○ A: $[3/\sqrt{14}, 1/\sqrt{14}, 2/\sqrt{14}]$
○ B: $[5/\sqrt{37}, -2/\sqrt{37}, 7/\sqrt{37}]$
○ C: $[1/\sqrt{37}, 8/\sqrt{37}, -3/\sqrt{37}]$
○ D: $[3/\sqrt{14}, -1/\sqrt{14}, 2/\sqrt{14}]$

19. The position vector of a point P(x, y, z) is denoted by?

○ A: $\overrightarrow{PQ}$
○ B: $\overrightarrow{P}$
○ C: $\overrightarrow{OP}$
○ D: All of the above.

20. k.k =?

○ A: 0
○ B: 1
○ C: -1
○ D: j

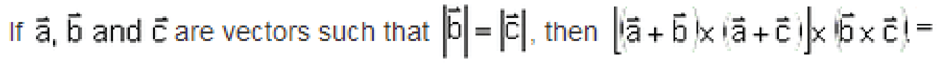
TEST 2

1. **If AB = i + j + k, AC = -4k and AD = i +2j - 8k then the volume of tetrahedron ABCD formed by the three vectors is?**

   ○ A: 1 ○ B: 2/3
   ○ C: 2 ○ D: 4

2. **What is the value of α such that αi + j , i + j + 3k and 2i + j - 2k are coplanar?**

   ○ A: 1/3 ○ B: 7/4
   ○ C: 9/5 ○ D: 8/5

3. 
   If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors such that $|\vec{b}| = |\vec{c}|$, then $\left[(\vec{a} + \vec{b}) \times (\vec{a} + \vec{c})\right] \times (\vec{b} \times \vec{c}) =$

   ○ A: 1 ○ B: -1
   ○ C: 0 ○ D: 2

4. **(2j x 3i).k = ?**

   ○ A: 0 ○ B: 7
   ○ C: 6 ○ D: -6

5. **What is the vector perpendicular to both vectors ā = 2i - j + k and ƃ = 4i + 2j - k?**

   ○ A: -i + 6j + 8k ○ B: -2i + 3j + 9k
   ○ C: 3i + 1j + 7k ○ D: 5i - 3j + k

6. **If ā = 2i - 4j + 5k and ƃ = 4i + xj - 4k. What is the value of x if ā and ƃ are perpendicular to each other?**

   ○ A: -1 ○ B: -2
   ○ C: -3 ○ D: -4

7. **Which of these vectors are parallel?**

   a = 2i + 3j + k, b = 4i + 6j + 2k, c = 6i + 9j + 3k

   ○ A: a and b ○ B: a and c
   ○ C: a, b and c all are parallel to each other.
   ○ D: None of them is parallel.

8. **Unit vector perpendicular to i - j and i + j is?**

   ○ A: k ○ B: -k
   ○ C: (i - j) / 2 ○ D: (i + j) / √2

9. **Which of the following expressions is meaningful?**

   ○ A: u.(v x w) ○ B: (u.v) .w
   ○ C: (u.v) . w ○ D: None of the above.

10. **Zero vector is?**

    ○ A: Parallel to every vector. ○ B: Perpendicular to every vector.
    ○ C: Both parallel and perpendicular to every vector.
    ○ D: Is inverse of every vector.

TEST 3

1. **The point which divides the line joining (2, 4, 5) and (-3, 5, - 4) in the ratio 2 : 3, lies on?**

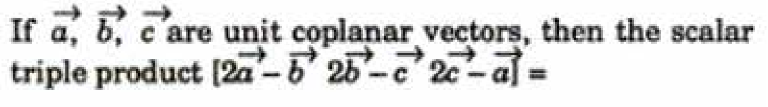
○ A: XY plane
○ B: YZ plane
○ C: XZ plane
○ D: None of the above.

2. **If result of two forces ā of magnitude (P) and б of magnitude (Q) isperpendicular to ā and has magnitude P. Then the magnitude of б is?**

○ A: P
○ B: P√2
○ C: P√3
○ D: 2P√3

3. **If ā x б = ā x ē then which of the following is true?**

○ A: ā, б and ē are coplanar.
○ B: ā, б and ē are orthogonal
○ C: б = ē
○ D: ā is parallel to б

4. 

If $\vec{a}, \vec{b}, \vec{c}$ are unit coplanar vectors, then the scalar triple product $[2\vec{a}-\vec{b}\ \ 2\vec{b}-\vec{c}\ \ 2\vec{c}-\vec{a}] =$

○ A: 0
○ B: 1
○ C: √2
○ D: √3

5. **If ā, б, ē, ō are the vertices of a square then?**

○ A: б - ā = ē – б
○ B: ā + б + ē = 0
○ C: (ē - ā) . (ō - б) = 0
○ D: None of the above.

6. **If the vectors a, b and c be the vectors representing the sides AB, BC and CA respectively of a triangle ABC, then?**

○ A: a.(bxc) = 0
○ B: (a.b) x c = (a.c) x b
○ C: |a x b| = |a x c| = |b x c|
○ D: |a x b| + |b x c| + |c x a| = 0

Position vector a = 2i - 3j and b = 3i + 2j. What are the coordinates of position vector that divides the line between a and b in ration 4:3?

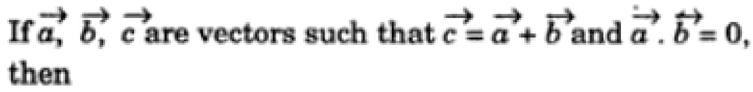
○ A: 11/7 i + 8/7 j
○ B: 1/7 i - 5/7 j
○ C: 18/7 i - 1/7 j
○ D: 23/7 i + 3/7 j

7. **The points (5, 2, 4), (6, −1, 2) and (8, −7, k) are collinear if k is equal to?**

○ A: 3
○ B: 2
○ C: -1
○ D: -2

8. **If A (-2,-3), B (1,4), C(0,-5) are three vertices of parallelogram ABCD. What are the coordinates of D if AB is parallel to DC?**

○ A: (3,14)
○ B: (-4,11)
○ C: (-3, -12)
○ D: (-4, 9)

9. 

If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{c}=\vec{a}+\vec{b}$ and $\vec{a}\cdot\vec{b}=0$, then

○ A: $a^2 + b^2 + c^2 = 0$
○ B: $a^2 - b^2 = c^2$
○ C: $a^2 + b^2 = 0$
○ D: $c^2 = a^2 + b^2$

10. **The point having position vectors $2\hat{i}+3\hat{j}+4\hat{k}$, $3\hat{i}+4\hat{j}+2\hat{k}$, $4\hat{i}+2\hat{j}+3\hat{k}$ are the vertices of a triangle. The triangle is?**

○ A: Right angled. ○ B: Equilateral.
○ C: Isosceles. ○ D: None of the above.

11. **The points with position vectors $14\hat{i}-13\hat{j}$, $12\hat{i}-5\hat{j}$ and $a\,\hat{i}+11\,\hat{j}$ are collinear if a equals**

○ A: 8 ○ B: 13
○ C: -5 ○ D: -9

12. **Angles α , β and δ are direction angles of a single vector only if?**

○ A: $\cos^2\alpha = \cos^2\beta = \cos^2\delta$ ○ B: $\cos^2\alpha = \cos^2\beta + \cos^2\delta$
○ C: $\cos^2\alpha + \cos^2\beta + \cos^2\delta = 0$ ○ D: $\cos^2\alpha + \cos^2\beta + \cos^2\delta = 1$

13. **Let $\vec{a}=\hat{i}-\hat{k}$, $\vec{b}=x\hat{i}+\hat{j}+(1-x)\hat{k}$ and $\vec{c}=y\hat{i}+x\hat{j}+(1+x-y)\hat{k}$, then $[\vec{a}\ \vec{b}\ \vec{c}]$ depends on**

○ A: Only x ○ B: Only y
○ C: Both x and y ○ D: Neither x nor y

TEST 4

1. **Unit vector in the direction of vector v = [-3,-4] is?**

○ A: -3/5 i - 4/5 j ○ B: -3/5 i + 4/5 j
○ C: 3/5 i - 4/5 j ○ D: 3/5 i + 4/5 j

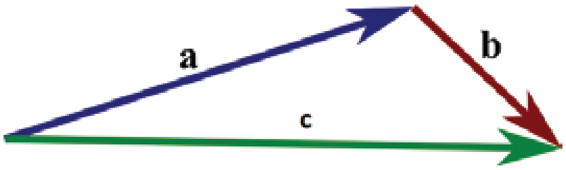
2. **Let a = 2i + j + k, a vector c perpendicular to a is?**

○ A: $\frac{1}{\sqrt{2}}(-j+k)$ ○ B: $\frac{1}{\sqrt{3}}(i+j-k)$
○ C: $\frac{1}{\sqrt{5}}(-i-j-k)$ ○ D: $\frac{1}{\sqrt{2}}(i-2j)$

3. **The area (in square units) of the parallelogram whose diagonals are $\vec{a}=\hat{i}+\hat{j}-2\hat{k}$ and $\vec{b}=\hat{i}-3\hat{j}+4\hat{k}$**

○ A: √7 ○ B: √11
○ C: √14 ○ D: Cannot be determined from the given information.

4. **In the figure below vector b is given by?**



○ A: c + a ○ B: c - a
○ C: a – c ○ D: None of the above.

5. Let $\alpha = (x + 4y)\vec{a} + (2x + y + 1)\vec{b}$ and $\beta = (y - 2x + 2)\vec{a} + (2x - 3y - 1)\vec{b}$, where $\vec{a}$ and $\vec{b}$ are non-zero, non-collinear. If $3\alpha = 2\beta$, then

○ A: x= 1, y = -2 ○ B: x= -2, y = -1
○ C: x= 2, y = 2 ○ D: x= 2, y = -1

6. For two position vectors ā and ƃ. The coordinates of position vector dividing the line between ā and ƃ in ration 1 : 1 would be?

○ A: (ā - ƃ) / 2 ○ B: (ā + ƃ) / 2
○ C: (ā + ƃ) / 4 ○ D: (ā - ƃ) / 4

7. If magnitude of vector ā = 25 the ā.ā = ?

○ A: 5 ○ B: 25
○ C: 625 ○ D: 0

8. Which of the following is not a defined quantity?

○ A: i.i / k.k ○ B: i.j / j.j
○ C: i.i / i.k ○ D: All of them are defined quantities.

9. If ā.i = 0 and ā.j = 0 and ā.k = 0 then value of ā is?

○ A: i + j + k ○ B: [-1,-1,-1]
○ C: Unit vector. ○ D: Null vector.

10. A particle acted upon by forces $3\hat{i} + 2\hat{j} + 5\hat{k}$ and $2\hat{i} + \hat{j} - 3\hat{k}$ is displaced from a point P to a point Q whose respective position vectors are $2\hat{i} - \hat{j} - 3\hat{k}$ and $4\hat{i} - 3\hat{j} + 7\hat{k}$. The work done by the force is

○ A: 16 ○ B: 24
○ C: 36 ○ D: 38

11. Value of [k, i, j] is?

○ A: 0 ○ B: 1
○ C: -1 ○ D: √-1

12. Area of a parallelogram which has vectors i and i + j as the adjecent sides is?

○ A: ½ ○ B: 1
○ C: 2 ○ D: √2

13. If ā x ƃ = i + 2j + 2k then ƃ x ā= ?

○ A: 1/3i + 2/3j + 2/3k ○ B: -i - 2j - 2k
○ C: 2i + 2j + k ○ D: None of the above.

14. If ā = ƃ then the value of triple scalar product ā.(ƃ x c) is?

○ A: 0 ○ B: 1
○ C: -1 ○ D: ā.ƃ

15. Which of the following quantities is undefined?

○ A: (i.i) / (i x j) ○ B: (i.j) / (j.j)

○ C: (j x k) / (i x j) ○ D: (i x k) / (j x j)

16. Which of the following statement is true?

If a.b = 0 a and b are parallel, If a x b = 0 then either a or b must be zero,

If a. (b x c) = 0 then a, b and c are coplanar.

○ A: iii only ○ B: i and ii only

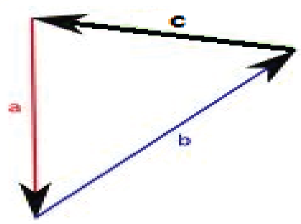
○ C: ii and iii only ○ D: i, ii and iii

17. If $u = 2\hat{i} - 4\hat{j} + 5\hat{k}$ and $v = 4\hat{i} - 3\hat{j} - 4\hat{k}$ then *u* and *v* are?

○ A: Parallel ○ B: Perpendicular

○ C: Equal ○ D: Opposite

18. Which of the following is true about the vector diagram given below?



○ A: c = a + b ○ B: c = a - b

○ C: a + b = 0 ○ D: a + b + c = 0

19. Which of the following position vectors have same magnitude?

a= [3,-4,2], b = [-3, 4, -2], c = [2, 4, 3]

○ A: a and b ○ B: a and c

○ C: All have same magnitude. ○ D: None of the has same magnitude.

20. In a parallelogram, the cross product of two adjacent vectors AB = i + 2j - 2j and BC = -2i + 2j + k is : 6i + 3j + 6k. The area of the parallelogram is?

○ A: 4.5 ○ B: 9

○ C: 15 ○ D: 18